

IRANIAN DRONE SHOOTDOWN
RAF LAKENHEATH F-15E ON TARGET OVER SYRIA

AIRFORCES MONTHLY

Officially the world's number one authority on military aviation

DUTCH F-16 SWANSONG
Orange Jumper testbed farewell

AFGHAN AIR POWER DEMISE
20 years to build, 11 days to collapse!

ESCAPE FROM KABUL
In-depth coverage of the vital airlift

PLUS THE BIGGEST & BEST MILITARY AVIATION NEWS ANYWHERE

EXCLUSIVE
ON FARAWAY SEAS



AFM discusses Carrier Strike Group 21 with Lizzy's Air Wing commander'

FRENCH STRATEGIC FORCES
Fighters still playing the nuclear game

SUKHOI SU-30SM
Russia's thrust-vectoring *Flankers* for all occasions

Issue 403 October 2021
£5.49
KEY Publishing
10
9 770955 709310


MBDA
MISSILE SYSTEMS
ASRAAM
REDEFINING THE WITHIN VISUAL RANGE COMBAT MISSION
In combat, the ability to strike first is vital. A pilot engaging an enemy needs a missile that is able to react more rapidly than ever before, with the speed and agility to maximise the probability of a kill regardless of the target aircraft's evasive manoeuvres or the deployment of countermeasures. ASRAAM provides these capabilities.
In service with the UK Royal Air Force and the Royal Australian Air Force; ASRAAM is fully integrated on Eurofighter Typhoon, F/A-18 Hornet and F-35 Lightning II.
SECURING THE SKIES
PROTECTING YOUR ASSETS
MASTERING THE SEAS
COMMANDING THE COMBAT ZONE
mbda-systems.com

Comment



Strategic airlifters, like the Boeing C-17A Globemaster III, played a huge part in the two-week Afghan evacuation. Here, evacuees are boarding C-17A 07-7170 from the 436th Airlift Wing at Hamid Karzai International Airport, Kabul on August 30 USMC/Staff Sgt Victor Mancillal

Afghanistan – more conflict to come?

Who could have ever imagined that the Afghan military would collapse inside 11 days? After all those billions of dollars spent on arming them, all with new aircraft, helicopters and weapons, all that training, the military just melted away, allowing the Taliban to take over the country.

During the 20 years that the US and its allies were in Afghanistan, more than 200,000 Afghan civilians were killed, most of them caught up in the bombs of the Taliban and other militias. More than 3,000 allied troops lost their lives, including 2,461 from the US and 457 from the UK. But in the end, it all seemed pointless. While courage cost those allied troops their lives, it was just what the Afghan military lacked in the face of the advancing Taliban.

There were of course some who did what they were trained to do, like the Afghan Air Force (AAF) pilots at Kabul and Mazar-i-Sharif who were bombing the Taliban (see *'Disintegrated in days'*, p66-69) up until August 14. Most of the pilots and technicians would have then fled over the Uzbekistan border into Termez, to where so many AAF aircraft fled. Those left behind now face persecution and retribution. I met several AAF personnel training in various countries and now wonder what happened to them – young, fresh faced guys excited at being overseas and having the opportunity to defend their country.

Images from various facilities, particularly Kabul, show MD530F Cayuse Warriors, A-29B Super Tucanos, Mi-17s and C-130Hs discarded and rendered useless by the US before they left. While the Taliban might get some Mi-17s airworthy with foreign support, the majority, like the fairly new US-built MD530Fs and A-29Bs will never fly again. In a briefing on August 30, Gen Kenneth F McKenzie (USMC), commander, US Central Command, announced that there were 73 aircraft now discarded in Kabul alone, mostly AAF but seven US Department of State Air Wing CH-46E Sea Knights were among them.

Undoubtedly the stars of this mass evacuation from Kabul, which saw 22 countries involved (see *'Escape from Kabul'*, p70-74) were the strategic airlifters. With hundreds of C-17A Globemaster IIIs, the US flights were the backbone of the exodus, dubbed by the US as Operation Allies Refuge.

By the time the midnight of August 31 deadline to leave Kabul had arrived, the largest non-combat evacuation in US military history had been achieved, in conjunction with numerous allied nations. Approximately 116,700 people, mainly Afghans, were evacuated in just 17 days, from August 14-31, with the UK's Operation Pitting calling upon 99 Sqn C-17As to bring out 14,700.

Now the US and its allies have left Afghanistan, the vacuum will undoubtedly be filled by terrorist organisations such as Islamic State seeking a safer place to plot against the west. Ironically, we could now see the US working with the Taliban to fight Islamic State in a classic case of 'the enemy of my enemy is my friend' scenario which will stick in the throats of the thousands who lost relatives either killed or wounded in Afghanistan over the past 20 years. There will of course be proxy war breaking out again with both India and Pakistan involved.

Militias have regrouped in the northern Panjshir Valley, once home to the Northern Alliance, which was led by the Lion of Panjshir, Ahmad Shah Massoud, who was assassinated in the days leading up to the September 11 attacks. Today his son has taken up his father's baton, to fight off any Taliban attack.

All this means that while the US and its allies have left Afghanistan, the violence is unlikely to end – there will be the inevitable retributions, but sadly war looks likely to linger on. The biggest victims will, of course, be the innocent civilians that have suffered enough in recent years.

Alan Warnes, Group Editor at Large



Visit our website at www.key.aero/airforcesmonthly

Contact the team at
editor@airforcesmonthly.com

Group Executive Editor: Richard Thomas
Group Editor at Large: Alan Warnes
Deputy Editor: Khalem Chapman
News Editor: Dave Allport
Assistant Military Editor: Josef Campion
Head of Publishing: Finbarr O'Reilly
Group Production Editor: David Taylor
Production Editors: Sally Hooton, Angharad Moran, Suzanne Roberts, Sue Rylance
Design: Lee Howson
Advertising: Andrew Mason, Debi McGowan
Head of Production: Janet Watkins
Head of Design: Steve Donovan
Head of Operations and eCommerce: Karen Bean
Head of Finance: Carol Pereira
Head of Creative: Hans Seeberg
Chief Digital Officer: Vicky Macey
Chief Content & Commercial Officer: Mark Elliott
Group CEO: Adrian Cox

SUBSCRIPTIONS
Copies of *AFM* can be obtained each month by placing a standing order with your newsagent. In case of difficulty, contact our Circulation Manager (subs@keypublishing.com).

Readers in the USA can place subscriptions by visiting www.imsnews.com or calling toll-free 757-428-8180 Alternatively, you can subscribe in writing to: *AFM*, International Media Service, PO BOX 866, Virginia Beach 23451, USA.

ADVERTISERS
We are unable to guarantee the bonafides of any of our advertisers. Readers are strongly recommended to take their own precautions before parting with any information or item of value, including, but not limited to, money, manuscripts, photographs or personal information in response to any advertisements within this publication.

USPS ID STATEMENT
AirForces Monthly, ISSN 0955-7091 (USPS 6119), is published monthly by Key Publishing Ltd, PO Box 300, Stamford, Lincs, PE9 1NA, UK.
The US annual subscription price is $72.99. Airfreight and mailing in the USA by agent named WN Shipping USA, 156-15, 146th Avenue, 2nd Floor, Jamaica, NY 11434, USA. Periodicals postage paid at Brooklyn NY 11256.
US Postmaster: Send address changes to *AirForces Monthly,* WN Shipping USA, 156-15, 146th Avenue, 2nd Floor, Jamaica, NY 11434, USA.
Subscription records are maintained at Key Publishing Ltd, PO Box 300, Stamford, Lincolnshire, PE9 1NA, UK.
Air Business Ltd is acting as our mailing agent.

SUBMISSIONS
The Editor is happy to receive contributions to *AFM*. Please note that all material sent to the Editor is forwarded at the contributor's own risk. While every care is taken with material, the publishers cannot be held responsible for any loss or damage incurred. All material rates available on request. Submitted material (especially illustrations) should have the contributor's name and address clearly marked and a stamped addressed envelope should be enclosed if it is required to be returned. All items submitted for publication are subject to our terms and conditions, which are regularly updated without prior notice and are freely available from Key Publishing Ltd or downloadable from www.keypublishing.com. All digital imagery should be at least 300dpi and 10 x 8 inches (25.4cm x 20.3cm) in size.
Postal address: Key Publishing Ltd, PO Box 100, Stamford, Lincs, PE9 1XQ, UK.
Tel: +44 (0)1780 755131 **Fax:** +44 (0)1780 757261
Website: www.Key.Aero

DISTRIBUTION
Seymour Distribution Ltd, 2 Poultry Avenue, London, EC1A 9PP.
Tel: +44 (0)20 7429 4000 **Fax:** +44 (0)20 7429 4001

Next Issue
On sale from October 21

Sign up for our free email newsletter at www.Key.Aero

Contents October 2021 #403



Features



66



44



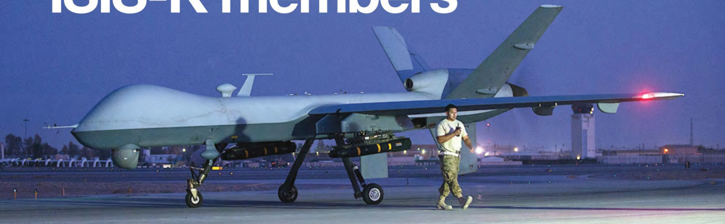
Cover: **The Royal Netherlands Air Force is preparing to withdraw and replace its Lockheed Martin F-16BM (MLU) Fighting Falcon testbed, serial J-066 'Orange Jumper', after 20 years of operations** *Frank Crébas* *Left top:* **Sikorsky UH-60A+ Black Hawk, serial 80-23450, of the Kandahar Air Wing is thought to have been captured by the Taliban. It is seen here during better times in 2018** *USAF/Staff Sgt Clayton Cupit* *Left below:* **Leonardo chief test pilot Mark Burnard (right) and company test pilot Lee Evans demonstrate the benefits of the AW149's 'low workload' design during a media flight on June 30, 2021** *Khalem Chapman* *Below:* **An Su-30SM pair from the 4th MShAP, a naval attack regiment home-based at Chkalovsk and assigned to the Baltic Fleet's aviation service** *Andrey Zinchuk* *Main image:* **A Rafale B from EC 2/4 'La Fayette' equipped with an inert ASMP-A missile during a training mission** *AAE/Laure-Anne Maucorpsk*



86

Regulars

US Reaper air strike in Afghanistan kills two ISIS-K members



Above: ***A US Airman assigned to the 62nd Expeditionary Reconnaissance Squadron finishes a post flight inspection on a US Air Force MQ-9A Reaper aircraft at Kandahar Airfield, Afghanistan, on August 13, 2015*** *USAF/Tech Sgt Joseph Swafford*

AN AIR strike using a General Atomics MQ-9A Reaper unmanned air vehicle was carried out by the US military on August 28, targeting ISIS-K militants in Afghanistan. The strike took place in Nangarhar Province to the east of Kandahar, killing two high-profile individuals who were known to be responsible for planning and facilitating terrorist activities within the organisation. A third ISIS-K member was wounded in the attack.

The mission was partly in retaliation for the suicide bomb attack at Kabul's Hamid Karzai International Airport on August 26, in which 13 US troops and more than 110 Afghan civilians were killed and a further 100 injured.

During a Pentagon briefing on August 28, US Army Maj Gen William D 'Hank' Taylor, deputy director of the Joint Staff for Regional Operations, said "we know of zero civilian casualties" as a result of the air strike.

Taylor also stated: "We will continue to have the ability to defend ourselves and to leverage over-the-horizon capability to conduct counterterrorism operations as needed."

Since the US announced its withdrawal from Afghanistan, the US military has confirmed that it will continue to be able to conduct an operation such as the Reaper strike in Nangarhar Province without having to launch it from within Afghanistan.

> ***"We continue to have the ability to conduct counter-terrorism operations as needed"***

A further strike with a Reaper was carried out on August 29, this time in the capital city of Kabul, targeting a vehicle that was being prepared for a suicide attack on the airport. Although there were unconfirmed reports of civilian casualties, a statement on the same day from US Central Command spokesperson Capt Bill Urban (USN), said: "We are aware of reports of civilian casualties following our strike on a vehicle in Kabul today. We are still assessing the results of this strike, which we know disrupted an imminent ISIS-K threat to the airport. We know that there were substantial and powerful subsequent explosions resulting from the destruction of the vehicle, indicating a large amount of explosive material inside that may have caused additional casualties. It is unclear what may have happened, and we are investigating further. We would be deeply saddened by any potential loss of innocent life."

Meanwhile, in a statement on August 28, US President Joe Biden said of the initial Reaper strike: "This strike was not the last. We will continue to hunt down any person involved in that heinous attack and make them pay. Whenever anyone seeks to harm the United States or attack our troops, we will respond. That will never be in doubt."

Afghan Air Force pilots flee to neig

IN AN effort to save some of its aircraft, Afghan Air Force pilots flew as many as possible out to neighbouring countries. Satellite imagery on August 16 of Termez Airport, just over the border in Uzbekistan, showed 22 fixed-wing aircraft and 24 helicopters from the AAF that appeared to have made it there safely. This confirms the numbers in an official statement issued by Uzbekistan.

Although difficult to confirm, the types appear to include seven UH-60As and 19 Mi-17s (some of these may be Uzbek Air Force examples); at least six A-29Bs; around five Cessna 208Bs and up to eleven Pilatus PC-12NGs. One A-29B crashed on August 15 as it crossed the border, although both pilots survived. Another UH-60A force-landed

Taliban seize Kabul airport following evacuation



Paratroopers assigned to the 82nd Airborne Division prepare to board the final US Air Force C-17A flight out of Kabul on August 30 *US Army/Master Sgt Alexander Burnett, 82nd Airborne Public Affairs*



Evacuees boarding Hungarian Air Force Airbus A319-112 604 at Hamid Karzai International Airport in Kabul on August 22, assisted by paratroopers assigned to the US Army's 1st Brigade Combat Team, 82nd Airborne Division, from Fort Bragg in North Carolina *US CENTCOM*

ONE MINUTE before midnight on August 30, the last US aircraft departed from Kabul/Hamid Karzai International Airport, Afghanistan, taking out the remaining military personnel from the country and ending the largest non-combat evacuation in US military history (see *'Escape from Kabul'*, p70-74, for more details). Almost immediately after the aircraft departed, the Taliban entered the airport and took over control.

Video footage that emerged the following morning showed a large number of aircraft that had been abandoned to their fate around the airport, the vast majority of which had belonged to the Afghan Air Force (AAF). Also seen in a hangar, however, were five of the seven US Department of State (DoS) Air Wing CH-46E Sea Knights, which the DoS had previously confirmed were deliberately abandoned after being disabled (see *'US State Dept abandons seven CH-46Es in Kabul'*, p26).

Although precise details remain sparse, Gen Kenneth F McKenzie (USMC), commander of US Central Command, confirmed in a press briefing on August 30 that there had been 73 aircraft left at Hamid Karzai, all of which had been disabled before the US withdrawal so that they could not be flown. In a lot of cases, many of the aircraft had already been out of service for some considerable time and would not have been airworthy anyway.

Former AAF fixed-wing aircraft left behind at Hamid Karzaithat have been identified so far include nine A-29B Super Tucanos, four Cessna 208B Grand Caravans, two armed AC-208 Eliminator variants, one C-130H Hercules and one Pilatus PC-12NG. Abandoned AAF helicopters included 12 UH-60A+ Black Hawks, ten Mi-8/17s and nine MD530F Cayuse Warriors. Also present at Kabul were eight An-26s and An-32s, plus three L-39 Albatroses, along with 12 Mi-35 helicopters, all of which had been out of service for many years.

Earlier, during the rapid Taliban advance across the country, numerous other aircraft were captured. Photographic evidence shows that, among these, the Taliban are confirmed as having captured an A-29B, Cessna 208B, 11 Mi-17s, an Mi-35, four UH-60As, ten MD530Fs and seven ScanEagle UAVs from various AAF bases. There will no doubt have been others as well.

It is not known how many of these aircraft were airworthy, but there are doubts the Taliban would be able to maintain them for any length of time. At least two or three Mi-17s have been seen airborne. In addition, one of three Black Hawks captured at Kandahar was seen flying for the first time on August 30. These could possibly be being flown by ex-AAF pilots who may have defected to the Taliban.

hbouring Uzbekistan

safely in Uzbekistan after running out of fuel on August 15-16.

Some other aircraft flew to Tajikistan. Precise details are unknown, although images that emerged on August 22 show at least 12 Cessna 208Bs parked on the airfield at Bokhtar Airport. Additionally, at least three UH-60A+ Black Hawks and one Mi-17V-5 escaped to Panjshir, where they are in use by the anti-Taliban forces of the Northern Alliance.

Final RAF Poseidon rolls off production line



BOEING HAS completed manufacture of the ninth and final Royal Air Force P-8A Poseidon MRA1. The aircraft, ZP809 (c/n 66109/8872) carrying test registration N673DS, appeared on the flightline for the first time at Renton, Washington, fully painted, on August 21, but at the time of going to press had yet to fly.

The initial five aircraft (ZP801 to ZP805) are all in service at RAF Lossiemouth, Moray, while the next three are currently still with Boeing. Of these, ZP806/N634DS (c/n 66106/8680) made its maiden flight on June 7, followed by ZP807/N665DS (c/n 66107/8719) on June 24 and then ZP808/N667DS (c/n 66108/8757) on July 22. All first flights originated at Renton but terminated at Boeing Field, Seattle, where the aircraft are outfitted with their mission systems.

Before the last RAF Poseidon rolled off the production line, there was another milestone: RAF/120 Squadron Poseidon MRA1 ZP805 'Fulmar' conducts the first drop of a Mk 54 Recoverable Exercise Variant Lightweight Torpedo on July 22 over the Moray Firth, near the type's base at RAF Lossiemouth *UK MOD Crown Copyright/Cpl Adam Fletcher*

Army Flying Grading unit elevated to squadron status

DURING A small ceremony at the Army Aviation Centre at Middle Wallop in Hampshire on August 2, the Army Flying Grading unit was officially upgraded to squadron status. It is now formally designated 674 (Army Flying Grading) Squadron and continues to fly from the airfield with its Grob Tutor T1s. The type is used as part of the initial pilot training selection process.The 674 Squadron, Army Air Corps (AAC) numberplate had previously been allocated to the AAC element of the RAF's 3 Flying Training School at RAF Barkston Heath, Lincolnshire, operating the Grob Prefect T1 for elementary flying training.

Gabon Government VIP Gulfstream at Farnborough



Above: ***Gabon Government Gulfstream G650ER TR-KGM (c/n 6137) visiting Farnborough, Hampshire, on August 11. This aircraft was delivered new to Gabon in 2015. It is operated by the Forces Aériennes Gabonaises (Gabonese Air Forces) Groupement de Liaisons Aériennes Ministérielles (Ministerial Air Liaison Group), which is based at Base Aérienne 01 Libreville-Leon M'Ba International Airport*** *Richard Vandervord*

New designation for Army jungle support unit

BRUNEI-BASED 7 Flight, Army Air Corps, which operates the Bell 212 AH1/AH3, has been re-designated as 667 Squadron. The change became official as from August 1.

The unit is at the British garrison at Medicina Lines, Seria, Brunei, where it has been present since November 1, 1994. It supports the resident infantry battalion from the Brigade of Gurkhas and also Training Team Brunei, which runs jungle warfare training courses through the British Army Jungle Warfare Training School.

No 667 Squadron was originally formed at Middle Wallop, Hampshire, on September 1, 1957. In its most recent incarnation, it operated from there as 667 (Development and Trials) Squadron, with Gazelle AH1s and Lynx AH7s, but was disbanded at the end of 2000.

Royal Navy RFA supports Haiti relief

A ROYAL Navy Wave-class fast fleet tanker has been provided by the UK government to serve as a landing pad for US helicopters involved in earthquake relief operations in Haiti. The UK government announced on August 19 that the Royal Fleet Auxiliary (RFA) Wave Knight (A389) will be part of the UK's support to the international humanitarian response mission.

On August 18, aircrew from the US Army's 1st Battalion, 228th Aviation Regiment, Joint Task Force-Bravo (JTF-B), at Soto Cano, Honduras, used one of the unit's UH-60L Black Hawks to conduct deck landing qualifications on the *Wave Knight* in the Caribbean. The ship was already in position in the Caribbean in readiness for the hurricane season and when the devastating earthquake struck Haiti on August 14, the vessel immediately sailed for the area and arrived off the Haitian coast on the afternoon of August 17.

Wave Rider is now supporting US Army JTF-B UH-60Ls operating in Haiti on relief operations, acting as a refuelling platform to avoid them having to make a long trip back to their base and saving a considerable amount of time. It also gives the UH-60L crews time for rest and any necessary mechanical repairs.

As part of the support mission, the ship's own Wildcat HMA2 helicopter, from 815 Squadron at RNAS Yeovilton, Somerset, has been flying from dawn until dusk to survey earthquake damage.



Above: ***A US Army UH-60L Black Hawk from 1-228th AVN, Joint Task Force-Bravo, lands on the Royal Navy's RFA*** **Wave Knight** ***in the Caribbean on August 18 during deck landing qualifications before beginning regular operations from the ship as part of Haiti earthquake relief operations*** *UK MOD Crown Copyright/LPhot Rory Arnold*

Early retirement date for Hawk T1s

PLANS TO retire the Royal Air Force's Hawk T1s have been accelerated. The UK Defence Command Paper on March 23 had set a date for the type's retirement of 2025. However, the Ministry of Defence has confirmed that the out-of-service date for the type will now be March 31, 2022, although the likelihood is they will stop flying before then.

The type is primarily used in the aggressor role by 100 Squadron at RAF Leeming, North Yorkshire, although two are also used for test and trials work at MOD Boscombe Down, Wiltshire. In addition, the T1 has been famously used by the RAF Red Arrows aerobatic display team since 1979 and will continue to fly the aircraft until 2030.

RAF No 30 squadron reformed to fly Airbus A400M

A NEW Royal Air Force Airbus A400M Atlas C1 unit is to be formed at RAF Brize Norton, Oxfordshire. No 30 Squadron will officially re-form at the base on September 28.

The type is already flown by three squadrons at Brize Norton: LXX Squadron, XXIV Squadron (the Air Mobility Operational Conversion Unit) and 206 (Heavy Aircraft Test and Evaluation) Squadron.

No 30 Squadron had last been operational flying the Hercules C4/5 but was disbanded after it flew its last flight with the type on December 8, 2016. There had been speculation ever since that it would re-form on the A400M, but with continuing cutbacks by the Ministry of Defence it had seemed doubtful whether this would happen, until Brize Norton confirmed details to *AFM* on August 12.

Super Puma visits Duxford airfield

An unusual visitor to the Imperial War Museum airfield at Duxford, Cambridgeshire, on August 19 was French Armée de l'Air et de l'Espace (French Air and Space Force) EC225LP Super Puma Mk II+ 2752 'SZ' from Groupe Aérien Mixte 56 'Vaucluse' at Base Aérienne 105 Evreux-Fauville. After leaving its home base, the helicopter had flown to Dublin Airport, Ireland, then routed via Stornoway, Scotland, to the Faroe Islands, before returning to Evreux via Edinburgh Airport, Scotland, and Duxford *Mike Shreeve*



B-2 mission over the North Sea



US Air Force/48th Fighter Wing F-15C Eagle 86-0160 'LN' from the 493rd Fighter Squadron 'Grim Reapers' at RAF Lakenheath, Suffolk, flies alongside B-2A Spirit 92-0700 'WM'/'Spirit of Florida' from the 509th Bomb Wing at Whiteman AFB, Missouri, over the North Sea on Wednesday, August 25. The B-2A was on a Bomber Task Force mission while deployed for the first time to Keflavik, Iceland USAF/Staff Sgt Rachel Maxwell

SkyGuardian begins trials at RAF Waddington



Above: Company-owned General Atomics MQ-9B SkyGuardian N190TC (c/n YBC01) during its first taxi trials at RAF Waddington, Lincolnshire, on the morning of August 25. Later in the day it made its first flight from the base, circling the local area at around 5,900ft, making a second flight later the same day. It was up again on August 27, initially again staying local before heading out over the North Sea at 20,000ft. The UAV is temporarily based for trials in advance of delivery of the RAF's similar Protector RG1s to the base Michael Hiley

MC-12W routing home through Mildenhall



US Air Force MC-12W Liberty 09-0686 callsign 'JAG44' landing at RAF Mildenhall, Suffolk, on August 11 after deployment downrange. It was accompanied by 09-0662 'JAG33', both of which departed again on August 14 via Prestwick Airport, Scotland, to Keflavik, Iceland, then onwards to the USA. They are assigned to the Oklahoma Air National Guard's 185th Special Operations Squadron at Will Rogers Air National Guard Base Peter Foster

Irish Air Corps' first C295W in production

THE INITIAL Airbus Defence C295W for the Irish Air Corps (IAC) is progressing well on the production line at Seville-San Pablo Airport, Spain.

Images released by the IAC on August 17 showed the front and rear fuselage sections of the aircraft, construction number 211, being mated on the Final Assembly Line.

A contract valued at approximately €221.6m for two of these aircraft for the IAC was signed on December 13, 2019 (see *'In Brief'*, February 2020, p13), making Ireland the 33rd country to order the type.

The acquisition project is part-funded by the European Maritime and Fisheries Fund Operational Programme, co-funded by the Government of Ireland and the European Union.

The aircraft will both be in a maritime surveillance configuration, equipped with the manufacturer's Fully Integrated Tactical System (FITS) and specific state-of-the-art mission sensors, along with Collins Pro Line Fusion avionics.

The aircraft are due for delivery to Baldonnel in 2023 to replace the two CN235M-100s currently in service with 1 Operations Wing/101 Squadron.

These were originally delivered in December 1994, although in 2007-8, they were upgraded by Airbus Military with the FITS, APS-143(V)3 Ocean Eye maritime surveillance radar and Star Safire III electro-optical and infrared (EO/IR) sensor.

As with the CN235s, the new C295s primary role will be maritime surveillance, with particular emphasis on fishery protection. However, they will also be used for a wide range of other roles, including logistics support, transport of troops and equipment, medical evacuation and air ambulance flights, search and rescue and general utility missions.



Above: ***The fuselage of the first Irish Air Corps C295W, c/n 211, being mated on the Final Assembly Line at Seville-San Pablo Airport, Spain*** *Irish Air Corps*

Norwegian Poseidon makes first flight



The first Royal Norwegian Air Force P-8A Poseidon, 9582/N682DS 'Vingtor,' takes off for its maiden flight on August 9 from Renton Municipal Airport, Washington. It landed 2hrs 24mins later at Boeing Field, Seattle, Washington. After installation of mission systems and testing, it will be handed over later this year. It had been rolled out on July 9 – see 'Norway's initial P-8A Poseidon now painted', September, p13 *NATO Air Command*

France tests H160 in Morocco

AIRBUS HELICOPTERS, the French Aviation Légère de l'Armée de Terre (ALAT – French Army Air Corps) and the Direction Générale de l'Armement (DGA – General Directorate of Armament) recently concluded tests in north Africa of the future H160 Guépard (Cheetah) military helicopter's ability to operate in a sand and dust environment. Announcing details of the trials on August 9, France's Ministère de Armées (Ministry of the Armed Forces) said they had taken place in Ouarzazate, Morocco.

Almost ten hours of flight testing were carried out on a commercial H160, which has been selected to be developed into the military Guépard variant for the French armed forces under the Hélicoptère Interarmées Léger (HIL, Light Joint-Forces Helicopter) programme. Data from the trials will now be analysed, although the effectiveness of the anti-sand filters protecting the engines has already been noted by pilots and maintenance technicians involved in the testing.

The tests also enabled evaluation of several alternative cleaning procedures for these filters and procedures were established with a view to optimising the availability of the helicopter in an operational scenario. The contribution of the H160's various piloting assistance systems to flight safety during landing phases with loss of visual references was also noted. The Forces Armées Royales du Maroc (Moroccan Royal Armed Forces) provided assistance with the trials, part of the H160 militarisation studies.

German H145Ms deployed to Kabul

GERMANY DEPLOYED two Special Forces H145M helicopters to Kabul, Afghanistan, to assist with the evacuation process. The helicopters were loaded onto a German Air Force Airbus A400M and then departed from Wunstorf Air Base in Germany, for Kabul on August 20. Due to the hazardous nature of travelling by road, they were being used to fly people from safe locations out to Kabul Airport, to board evacuation flights.

The helicopters, serials 76+02 and 76+13, are two of the 15 operated by the German Air Force's Hubschraubergeschwader 64 (HSG64, Helicopter Wing 64)/644 Staffel (Squadron) at Laupheim. As soon as they had arrived in Kabul, work got under way to quickly re-assemble them (basically, re-attaching the main rotors) so that they begin operations as soon as possible.

The H145Ms were working in conjunction the German Army's Kommando Spezialkräfte (Special Forces Command), which has had some personnel deployed to Kabul's Hamid Karzai International Airport since August 16. They joined British and French military personnel, who had already been working on the ground to rescue people from outside the airport perimeter, to bring them to safety prior to evacuation by air.

In addition to standard H145M equipment, Germany's examples also have provision for fast-roping equipment and are fitted with missile approach warning sensors and decoy flare dispensers on the skids. They are also capable of being fitted with G6 7.62mm Minigun Gatling-type machine guns mounted on either side in the main cabin doors for self-protection.

During loading at Wunstorf, the guns were not immediately apparent on the two helicopters destined for Kabul, although the gun mount was visible on at least one of them, so it seems likely they were to be installed after arrival in Kabul.

Deployment of the H145Ms was at the request of the US government, as their smaller size, compared with the US helicopters then operating around Kabul, means they can get into tighter spaces in the urban environment of Kabul city. The German government said they were to evacuate not only German nationals, but any other people who were at risk in the city.



Above: ***German Air Force H145M 76+02, surrounded by equipment, awaits unloading from an A400M at Kabul after departing from Wunstorf on August 20*** *Bundeswehr*

Norway receives another three F-35As

THREE MORE Royal Norwegian Air Force (RNoAF) F-35A Lightning IIs have arrived in Norway, increasing the RNoAF's fleet to 31 aircraft.

This batch, serials 5501 (AM-29), 5502 (AM-30) and 5503 (AM-31), left Fort Worth, Texas, on August 11 and arrived at Ørland Hovedflystasjon (Main Air Station) later that day. With this latest delivery, the RNoAF's F-35A fleet now stands at 31 aircraft – 21 of them located in Norway, with a further ten examples in the US for training.

Norway is still phasing the F-35A into operational service and the training of personnel relating to the type continues as normal at Luke Air Force Base in Arizona.

RNoAF Air Wing Commander, Col Øivind Gunnerud, said: "It is both important and impressive to receive new aircraft. Important for the long-term goal of full operational capability (FOC) in 2025 and because we need these aircraft to take over NATO's combat aircraft readiness from [Evenes Flystasjon (Air Station)] in January 2022." The RNoAF declared initial operational capability (IOC) with its F-35A force on November 6, 2019.

The type completed its first deployment in support of NATO's Icelandic Air Policing mission in early 2020. This autumn, Norwegian F-35As and associated personnel will deploy to the Netherlands to conduct a Weapon Instructor Course (WIC). From 2022, the Lightning II will take over Norway's domestic quick reaction alert (QRA) duties from Evenes – when the RNoAF also begins to phase out its F-16AM/BM (MLU) Fighting Falcon fleet.

In the lead up to the F-35A's FOC declaration, the type will be used for joint training and integration with both Norwegian and allied forces. Norway intends to procure 52 F-35As in total.

In RNoAF service, the type will be used to support a variety of air, land and maritime operations in support of both Norwegian and allied forces. An additional three aircraft are due to arrive at Ørland before the end of this year.



Royal Norwegian Air Force F-35A Lightning II 5503 touches down at Ørland Air Base on August 11 at the end of its non-stop delivery flight from Fort Worth, Texas *Forsvaret/Johannes Havn*

New Bahrain Royal Flight RJ70 delivered through Malta

A NEW Avro RJ70 acquired by the Bahrain Amiri Royal Flight passed through Luqa Airport, Malta, on August 27 during its delivery flight. The aircraft, A9C-BRF (c/n E1267), arrived from Norwich Airport, Norfolk, in the UK, where it had been painted in its new Royal Flight colours. It then departed for Sharm El Sheikh, Egypt, before continuing on to Bahrain.

Built in 1995, it was originally delivered to Air Malta, later being operated by Abu Dhabi's Amiri Flight for some years before being latterly owned by UK business magnate and former Formula One Group CEO Bernie Ecclestone with registration M-STRY. It had been flown to Norwich from Cranfield Airport, Bedfordshire, on July 30 to be painted in the colours of its new owner. The new Bahraini serial was previously used by a Gulfstream GIV-SP which was sold in Switzerland in November 2019.

The RJ70 joins an extensive Royal Flight fleet, which also includes two RJ85s and an RJ100.



New Bahrain Amiri Royal Flight Avro RJ70 at Luqa Airport, Malta, on August 27 during its delivery flight after painting at Norwich *Ruben Zammit*

Portuguese Navy takes delivery of first upgraded Lynx Mk95A

LEONARDO ANNOUNCED on July 28 that the Marinha Portuguesa (Portuguese Navy) had recently taken delivery of its first upgraded Lynx Mk95A at Montijo, Portugal. Modernisation work included the installation of LHTEC CTS800-4N engines, a new glass cockpit with integrated display units, a tactical processor, upgrades to the avionics suite and a new electrically powered rescue hoist.

All five of the Marinha's Lynx Mk 95s are being modernised to the Mk 95A standard. The first upgraded Lynx had reflown at Leonardo's Yeovil site on February 14, 2020 (see *'Upgraded Portuguese Super Lynx flown'*, April 2020, p13).

Since then it has been undergoing extensive flight testing of its new systems.

Formal closure of Châteaudun

A FORMAL ceremony was held at the Armée de l'Air et de 'Espace's (AAE, French Air and Space Force's) Élément Air Rattaché 279 (EAR 279, Attached Air Element 279) Châteaudun on July 21 to mark the dissolution of the site. The event concluded with a flypast by a number of Dassault Rafales. This marked the departure of most of the remaining workforce, leaving a skeleton staff of just 20 people to finish off winding down the base, which will be fully closed down by the end of the year.

The base had been a major maintenance and storage facility, becoming well known for its long lines of retired French military aircraft held in open storage, most of which were ultimately scrapped. Following a decision to close the base as part of overall restructuring of the AAE, activities have been progressively reduced. As far back as July 2014, the airfield had formally lost its status as Base Aérienne 279 (BA 279, Air Base 279) and became EAR 279 as a detachment under the control of BA 123 Orléans-Bricy.

Although most of the airfield will be sold off, a military aviation museum on the site, the Conservatoire d'Aéronefs non Opérationnels Préservés et Exposés, which has a collection of 45 aircraft, will remain on site.

First Luftwaffe C-130J painted



The first German Air Force C-130J-30 Super Hercules, 55+01 (c/n 5930), being towed out of the paint shop in Marietta, Georgia, in appalling weather on August 21. As previously reported, it had rolled off the production line and was towed to the paint shop on July 22 – see 'Luftwaffe's initial C-130J rolled out', September, p14. It is one of three C-130J-30s and three KC-130J tankers that will be delivered to the joint Franco-German unit at Base Aérienne 105 Evreux-Fauville, France *Lockheed Martin*

KEY Publishing

VIP Club

GET TWO E-BOOKS FREE

The latest books and special issues from the world's best aviation publisher

Britain's Military Helicopters

Chris Gibson

From landing pads hacked out of the rainforest to the pitching deck of a frigate, helicopters bring unmatchable flexibility to armed forces. Whether anti-submarine operations by a Merlin, fire support from an Apache, stores delivered by a Puma, evacuation of the wounded by a Chinook or rescue by a Sea King, helicopters have offered the British armed forces a huge variety of capabilities.

Along with a selection of original and archive images (many previously unpublished), Chris Gibson describes the evolution of the helicopter in British service, from its beginnings with the Sikorsky R-4B test flown by Fleet Air Arm pilots in the USA to the latest Merlin Crowsnest, Chinook and Apache Guardian.

Key Modern Military Aircraft Series (No. 4); 96 pages; more than 140 illustrations; softback **£15.99**

VIP CLUB FACT

The British General Staff were very keen on the Agusta A129 Mangusta as its attack helicopter until the Apache became a TV star in January 1991.



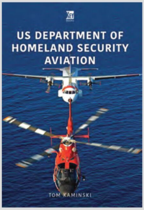
Drones: Unmanned but On-target

Mark Ayton

A small helicopter-like model bought from a local toy store or a major military weapon system?

This book focuses on the unmanned aerial vehicles (UAVs) now widely used by armed forces around the world, none more so than the United States. It details many of the major drone types and missions flown by these technologically advanced, unmanned, remotely piloted air vehicles, from both land bases and aircraft carriers. It offers a fascinating insight into how air warfare is likely to be conducted in the future. *116 pages; softback;* **£8.99**





US Department of Homeland Security Aviation

Tom Kaminski

The US Department of Homeland Security was created in response to the 9/11 attacks on New York's World Trade Center in 2001. Its agencies were tasked with analysing threats and intelligence, guarding borders and airports, protecting critical infrastructure and co-ordinating the nation's response to future emergencies. The department's aviation assets comprise more than 200 aircraft of the world's largest coast guard and 240 flown by US Customs and Border Protection (AMO). Much work has been done within both organisations to integrate, consolidate and update their fleets of fixed-wing, rotary-wing and remotely piloted unmanned aircraft. This richly illustrated book explores their history, development and daily operations. *96 pages; more than 120 illustrations; softback* **£15.99**

Typhoon to Tempest

Mark Ayton

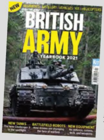
The Eurofighter Typhoon remains Europe's primary multirole fighter. Following a dearth of orders during the first decade of the 21st century, the type has found more recent sales success from Gulf states. Procuring the latest variants, Kuwaiti and Qatari Typhoons will be equipped with the latest technology and armaments. For the RAF, Typhoon will lead to the Tempest weapon system, which remains an unknown entity by way of design and configuration and has an ambitious development timeline. Produced with co-operative input from all the defence industry players involved, this book provides the latest information about today's Typhoon, tomorrow's Typhoon and the all-new Tempest. *116 pages; softback;* **£8.99**



British Army Yearbook 2021

Tim Ripley

It has been a momentous year for the British Army. In March, the government's Integrated Security, Defence and Foreign Policy Review set a new path for the service with a shift towards hi-tech weapons. The army played a leading role in the funeral of Prince Philip, Duke of Edinburgh, and thousands of soldiers have been on duty responding to the COVID-19 pandemic. This publication looks at these events and their implications for the future. It includes information about current operations and overseas exercises, plus insights into the latest equipment on order. *116 pages; softback;* **£8.99**



JOIN TODAY at keypublishing.com/vip-book-club

Be the first to find out about our forthcoming book releases and receive exclusive offers. Register today at keypublishing.com/vip-book-club and, as a thank you, we'll give you TWO free e-books straight away!

Nighthawks over Nevada



While the USAF formally retired the F-117A Nighthawk from operational frontline service in 2008, the type continues to be flown in secret Rod McDonough

FOUR LOCKHEED F-117A Nighthawks operated by the USAF were observed flying missions over northern Rachel, Nevada, during the final days of Exercise Red Flag 21-3, which was held 139 miles away at Nellis AFB, near Las Vegas.

The four stealth attack aircraft were observed flying in two pairs over Rachel on August 2. The initial two F-117As passed through at 1310hrs (local time), followed by the second pair at approximately 1410hrs. Rod McDonough – an aviation photographer who sent images from the recent sighting to *AFM* – noted that it looked "like there were three different airframes" involved in the secretive mission that day.

Some of the pilots in the aircraft were seen sporting red patches, while others were observed wearing green ones. Additionally, one of the F-117As had a small marking near its exhaust on the aircraft's starboard side, which was not featured on the other aircraft that day. Another example – which was observed flying in the second pair – was seen flying with a very worn livery, when compared to the others.

As is usual with F-117A sightings in recent years, none of the aircraft had an identifiable serial number, but had the 'TR' tail code, which is associated with the Tonopah Test Range – a long-term base for the Nighthawk during its operational frontline service years. All four of the F-117s wore USAF markings.

AFM reached out to both the USAF and Nellis AFB Public Affairs Offices for a comment on the F-117A's potential involvement in Exercise Red Flag 21-3, but neither responded by the time this article was published.

When the USAF officially retired the type from operational frontline service in 2008, 52 examples were placed into long-term Type 1000 storage at the Tonopah Test Range airfield, which is a part of the Nellis Test and Training Range. While at least one aircraft was subsequently broken up to demonstrate the disposal techniques for the platform, several others have recently found new homes at a number of air museums across the continental US.

Stingray refuels E-2D for the first time



The sole MQ-25A prototype, N234MQ (c/n 00001) 'T1', refuels the US Navy's E-2D Advanced Hawkeye prototype – BuNo 166501 'SD-501' (c/n AA-1) 'Delta One' for the first time Boeing

THE US Navy's Unmanned Carrier Aviation programme completed its first aerial refuelling flight with an E-2D Advanced Hawkeye during a sortie from MidAmerica Airport in Mascoutah, Illinois.

It was on August 18 that the Boeing-owned MQ-25A Stingray test asset, known as T1, transferred fuel to the E-2D – the newest variant of the E-2 platform, which was upgraded with an aerial refuelling capability in 2019.

Capt Chad Reed, the US Navy's Unmanned Carrier Aviation (PMA-268) programme manager, said: "Once operational, the MQ-25 will refuel every receiver-capable platform, including E-2. This flight keeps us on a fast track to getting the Stingray out to the fleet where its refuelling capability will greatly increase the range and operational flexibility of the carrier air wing and strike group."

This test marks the second refuelling flight for the MQ-25 programme. In June, the government/industry team completed the historic first unmanned tanking flight with an F/A-18F Super Hornet.

During the six-hour flight, US Navy E-2D pilots from Air Test and Evaluation Squadron Two Zero (VX-20) approached T1, performed formation evaluations, wake surveys, drogue tracking and plugs with the MQ-25 test asset at 220kts calibrated airspeed (KCAS) and 10,000ft.

This test enables the programme to analyse the aerodynamic interaction of the two aircraft. The team can then determine if any adjustments to guidance and control are required and make those software updates early, with no impact to the test schedule.

Testing with T1 will continue for several months before the MQ-25 engineering, manufacturing and development aircraft are eventually delivered next year.

60th FS reactivates with F-35A

THE USAF officially reactivated the 60th Fighter Squadron (FS) 'Fighting Crows' at Eglin AFB, Florida, under the 33rd Fighter Wing (FW) – a component of the 19th Air Force, Air Education and Training Command – on August 20.

The squadron will plan and execute a training curriculum in support of USAF training requirements for the F-35A Lightning II Joint Strike Fighter. The unit becomes the second F-35A squadron under the 33rd FW, joining the 58th FS 'Mighty Gorillas'.

Col Jack Arthaud, 33rd FW commander, said: "Standing up a second F-35 squadron marks a pivotal moment in our Wing's history as a premier producer of combat readiness."

F-35B Lightning IIs conduct first-of-kind cross-deck ops

LOCKHEED MARTIN F-35B Lightning IIs assigned to the USMC's Marine Fighter Attack Squadron 211 (VMFA-211) 'Wake Island Avengers' conducted a first-of-its-kind operation on August 20. The fifth-generation multi-role stealth fighters launched from the HMS *Queen Elizabeth* (R08) and landed aboard the amphibious assault ship, USS *America* (LHA-6).

The operation highlighted the interoperability of the F-35B and the strategic importance of joint integration between the UK Carrier Strike Group (CSG) and the US Navy Amphibious Ready Group/ Marine Expeditionary Unit. This mission was the first time in modern history the US has cross-decked aircraft for a mission utilising a foreign aircraft carrier, demonstrating naval partnerships in action. Distributed maritime operations call for US Naval forces to operate in a less concentrated and more distributed manner to complicate an adversary's ability to find, track and target them while still delivering decisive combat power where needed. The multi-national maritime aviation operation extends the reach of the F-35, enabling the fifth-generation aircraft to carry out objectives further away, for extended amounts of time with more ordnance capacity.

In planning guidance released to the fleet, the Commandant of the Marine Corps highlighted that the USMC is a naval expeditionary force capable of deterring malign behaviour and, when necessary, fighting inside adversaries' sensors and weapons engagement zones to facilitate sea denial in support of fleet operations and joint-force horizontal escalation.



Above: **VMFA-211 F-35B Lightning II, BuNo 169621 'CF-01', which is embarked on the Royal Navy aircraft carrier HMS Queen Elizabeth (R08), takes off from the flight deck of the forward-deployed amphibious assault ship USS America (LHA-6) during joint cross-deck flight operations between the two ships on August 20** *US Navy/Mass Communication Specialist 3rd Class Matthew Cavenaile*

VMFA-211's F-35B short take-off and vertical landing aircraft capabilities make them uniquely qualified to support distributed maritime operations and capable of operating from HMS *Queen Elizabeth*.

On August 20, CSG 21 and the USS America Expeditionary Strike Group (AMA ESG) with embarked 31st Marine Expeditionary Unit, begin multinational advanced aviation operations in support of Large Scale Global Exercise (LSGE) 21.

LSGE 21 is a global command and control exercise, with a regional focus, to enhance integration of the US and its allies and partners in the Indo-Pacific. With many operations, activities and investments nested under the LSGE 21 umbrella, these operations are part of the larger initiative. While sailing together, the strike groups will conduct large formation steaming manoeuvres, anti-submarine and surface warfare exercises and aviation integration events to enhance their capability and proficiency throughout all domains.

47th FTW unveils heritage Jayhawk

BEECHCRAFT T-1A Jayhawk – serial 91-0086 'XL', assigned to the USAF's 47th Flying Training Wing (FTW) – was unveiled during a ceremony on August 13 in new 86th Flying Training Squadron (FTS) 'Rio Lobos' heritage colours at Laughlin AFB, Texas.

The paint scheme represents that worn during World War Two by the Douglas B-18 Bolo bombers operated by the unit, which was then designated the 86th Bombardment Squadron. It also honours the airmen who served on the aircraft, with the nose inscribed in Capt Glen Edward's memory in honour of his service to the USAF. The nose also carries Lt Col Shawn Cheney's name. He is the current 86th FTS Director of Operations.

Nose art on the port side just behind the cockpit depicts a greatly enlarged version of the unit emblem, while the nose on that side also bears 11 mission markings, represented by bomb silhouettes. A crescent moon just below the cockpit reflects its night attack mission during World War Two. The opposite (starboard) side has mission markings and a large '86' in yellow.



Above: **USAF/47th FTW Beechcraft T-1A Jayhawk 91-0086 'XL' in a hangar prior to being unveiled on August 13 in new 86th FTS 'Rio Lobos' heritage colours at Laughlin AFB, Texas** *USAF/Senior Airman Nicholas Larsen*

First TH-73A Thrasher delivered to Whiting Field

THE FIRST operational TH-73A Thrasher training helicopter (BuNo 170138 'E-610') was delivered to the US Navy's Training Air Wing 5 (TAW-5) at NAS Whiting Field in Milton, Florida, on August 6. Based on Leonardo Helicopter's model AW119Kx helicopter, the single-engine commercial off-the-shelf (COTS) TH-73A will replace the Bell TH-57B/C Sea Rangers that currently serve as the US Navy's undergraduate training helicopter.



US Navy TH-73A Thrasher BuNo 170138 'E-610' makes its final approach to land at Naval Air Station Whiting Field in Milton, Florida, following its delivery flight on August 6 US Navy/Lt Michelle Tucker

The AW119 was selected as the winner of the service's Advanced Helicopter Training System (AHTS) competition on January 13, 2020. The first TH-73A was accepted by the US Navy during a ceremony at Leonardo's AgustaWestland Philadelphia facility in Pennsylvania, on June 10, 2021 (see *'A welcome for initial US Navy TH-73A'*, August, p18), 18 months after contract award.

The US Navy's plans include purchasing 130 TH-73As as replacements for 113 TH-57B/Cs at a cost of US$648m. Procurement will be carried out in five lots and Leonardo has already received orders for 68 of these helicopters in two contracts. The initial US$177m contract for 32 helicopters was awarded on January 13, 2020, followed by an US$171m deal for 36 more on November 12, 2020. All of the initial 32 helicopters are due this year with deliveries to continue through 2024.

The TH-73A will fulfil advanced rotary wing and intermediate tilt-rotor training requirements for the US Navy, Marine Corps and Coast Guard through to 2050. Sundown of the TH-57 fleet will begin in 2022 and conclude in 2025 when the last examples are retired. Compared with the Sea Ranger, the TH-73A delivers increased performance in power, speed, payload and overall endurance.

The AHTS also includes aircrew training services that comprise new simulators and curriculum. Maintenance and flight line support of the helicopters will be provided by Vertex Aerospace under a new contractor logistics support contract. Operations will be supported by a new hangar that will be constructed at NAS Whiting Field beginning in 2023. In addition, Leonardo Helicopters has established a temporary TH-73A maintenance support centre at Peter Prince Airport in East Milton, Florida. However, it is constructing a 100,000sq ft helicopter support centre at Whiting Aviation Park, adjacent to the air station, where immediate maintenance and repairs will be carried out.

The initial Thrashers will be used by TAW-5's Helicopter Instructor Training Unit to validate the updated curriculum. Students assigned to the wing's Helicopter Training Squadron 8 (HT-8) 'Eight Ballers' will be the first to train on the new helicopter and instruction will begin sometime in 2022. The TH-73A is named after the Brown Thrasher, a fiercely territorial bird found throughout the eastern US.

Final MC-130H PDM now complete

THE FINAL US Air Force MC-130H Combat Talon II aircraft to receive programmed depot maintenance (PDM) at the Warner Robins Air Logistics Complex at Robins Air Force Base, Georgia, has been completed. The aircraft, serial 87-0023, departed the base on August 20 to return to its unit, the 1st Special Operations Wing's 15th Special Operations Squadron (SOS) 'Global Eagles' at Hurlburt Field, Florida. The MC-130H variant is currently being phased out of USAF service to be replaced by the MC-130J Commando II.

The MC-130H provides infiltration, exfiltration, and resupply of special operations forces and equipment in hostile or denied territory. Its secondary missions include psychological operations, and helicopter and vertical lift air refuelling. According to Doug Ruggerio, 560th Aircraft Maintenance Squadron C-130 senior master scheduler, the PDM process for the new MC-130J model will start in fiscal year 2023.

A total of 24 production MC-130Hs were delivered to the USAF, four of which have been lost in accidents. Eight others are now stored with the 309th Aerospace Maintenance and Regeneration Group (AMARG) at Davis-Monthan Air Force Base, Arizona. As wind-down of operations with the type began, the first of these arrived at AMARG on September 21, 2015, while the most recent arrival there was on August 13, 2021.

All 12 of the remaining operational MC-130Hs are now operated by the 15th SOS. The variant was also flown by the 353rd Special Operations Group's 1st SOS 'Stray Goose International' at Kadena Air Base, Japan, until a couple of years ago.



Above: ***US Air Force MC-130H Combat Talon II 87-0023 departs from Warner Robins Air Logistics Complex at Robins Air Force Base, Georgia, on August 20. The aircraft was the last of this variant to undergo PDM as the type is being progressively withdrawn and replaced by the MC-130J*** *USAF/Joseph Mather*

BACN EQ-4B Global Hawks retired

US AIR FORCE Northrop Grumman EQ-4B Block 20 Battlefield Airborne Communications Node (BACN) Global Hawk serial number 04-2018 'GF' made the type's final landing back at Grand Forks Air Force Base, North Dakota, on July 29. To mark retirement of the BACN EQ-4B, as it taxied in it was welcomed by a traditional water cannon salute.

The EQ-4B had been operated from Grand Forks by Air Combat Command's 319th Reconnaissance Wing (RW)/348th Reconnaissance Squadron (RS) 'Northern Hawks' and regularly flew an average of 10,000 hours annually following its arrival at the base in 2011.

The EQ-4Bs are now stored at Grand Forks pending a decision on their future disposition.



Above: ***The final BACN EQ-4B flight returns to Grand Forks AFB, North Dakota, on July 29. Note the extensive patching on the rear fuselage, emphasising the wear and tear encountered by these airframes during operations*** *USAF/Senior Airman Dakota C LeGrand*

The 319th RW continues to operate standard RQ-4B Global Hawks, while the BACN system remains operational on the Bombardier E-11A, variants of the Global Express business jet. Although only three E-11As are in service (a fourth having been lost in Afghanistan on January 27, 2020), more are being acquired to replace the EQ-4Bs. Five EQ-4Bs were acquired, all Block 20 airframes and comprising serial numbers 04-2015, 04-2017, 04-2018, 04-2019 and 04-2020. Of these, 04-2017 was lost in a crash in Afghanistan on August 20, 2011.

Bell provides update on 360 Invictus progress

BELL TEXTRON has released new data on the build and testing for the Bell 360 Invictus competitive prototype. In a press release on August 11, the company said that the Bell 360 program is rapidly progressing through manufacturing, assembly, components testing and systems integration work for the US Army's Future Attack Reconnaissance Aircraft (FARA) programme.

The team has completed multiple design and risk reviews with the US Army and is on schedule for all programme requirements. The Bell 360, a low-risk, high-speed platform with proven technology and inherently reliable designs, will deliver soldiers transformational operational capabilities at an affordable cost, says the company.

Since beginning the build in late 2020, Bell has made significant progress on the Bell 360 Invictus fuselage, main rotor blades, gearbox assembly, cases and other high-value components. By implementing a design-as-built methodology that digitally connects the entire programme throughout its lifecycle, Bell says it has increased its ability to collaborate in real-time with programme partners and the Army. This method accelerates decision-making among distributed teams using a common, secure data environment that creates a singular source of data for the programme leading to reduced assembly, rework time and cost.

Along with assembling the Bell 360 Invictus, high-value components such as the main rotor gearbox, driveshafts and couplings are being tested at Bell's Drive Systems Test Lab (DSTL). The DSTL is used to carry out risk-reduction efforts that ensure the programme has accurate and verified data to qualify components in advance of flight test.

A new FARA-specific Systems Integration Lab (SIL) is also operational at Bell. This facility allows Bell to integrate flight-critical components, software and mission systems for testing, verification and validation of functionality before they take flight on an actual aircraft. This approach reduces technical risk and will aid in the safe, rapid and efficient execution of flight test programme.

The US Army initiated the FARA programme in 2018 to find a belated replacement for the OH-58 Kiowa Warrior, which was retired in 2014, as part of the Future Vertical Lift programme. An initial five competitors were whittled down to just two for Phase Two of the competition, with Bell and Sikorsky selected on March 25, 2020, to proceed with development of flying prototypes. This phase is to end by autumn 2023 with a government flight test evaluation of the two competing prototypes.



This image, released on August 11 by the manufacturer, shows the Bell 360 Invictus under assembly on June 28, highlighting the progress being made. First flight is scheduled for next year *Bell Textron*

Sherpas depart from AMARG

THREE RETIRED former US Army C-23B+ Sherpas have recently departed from storage with the 309th Aerospace Maintenance and Regeneration Group (AMARG) at Davis-Monthan Air Force Base, Arizona. Destined for a new life in civilian hands, the aircraft follow four others that left this year.

The latest departures comprised 93-1321 and 93-1334, which left Davis-Monthan on August 19, after earlier being withdrawn from storage on April 21 and 22, respectively, and moved to the adjacent Pima Air and Space Museum for restoration prior to ferry flights to their new owner. The aircraft had been at AMARG since December 8, 2014 and November 25, 2014, respectively.

The aircraft have been acquired by Daggaro, an aviation and logistics company based in the Cayman Islands, which offers services for specialised cargo, medical transport, disaster response, aircraft maintenance, government support, aircraft management and evacuation. After a multi-leg ferry flight, the first aircraft, which had been registered as N330PW (ex 93-1334) on June 6, arrived in the Cayman Islands on August 21.

Earlier, on August 3, another C-23B+, 93-1335, left for Blue Tide Aviation of Fort Lauderdale, Florida, to which it was registered as N282BT on June 25. It had been stored at AMARG since December 29, 2014. The company will use the aircraft for cargo delivery, disaster response, government services and skydive/jump training.

Having completed deliveries of a number of the surplus Sherpas to various government agencies and overseas air arms that requested them, the remainder are now being sold off. Earlier this year, six others also left AMARG, all initially going to the Pima Air and Space Museum to be prepared for delivery flights. Three were acquired by Win Win Aviation Inc of Wake Forest, North Carolina. These aircraft comprised 90-7012/N312WW, 90-7015/N316WW and 90-7016/N316WW – the first two of which left AMARG on April 21 and the third on April 16. Another, 94-0310, departed on April 22 for Bombardier Services Corp, which is based in Bridgeport, West Virginia.

These disposals leave just two C-23Bs remaining with AMARG – 90-7014 and 94-0308, which arrived there in 2015 – along with four C-23Cs (93-1332, 93-1333, 94-0312 and 94-0313), which all arrived on October 15-16, 2014.



Former US Army C-23B Sherpa 93-1335/N282BT prepares to depart from Davis-Monthan Air Force Base on August 3, to begin a new civilian life with Blue Tide Aviation USAF/R Raine

Final flight for Eglin F-15C

US AIR Force F-15C Eagle 82-0025 'ET' operated by the 96th Test Wing's 40th Flight Test Squadron (FLTS) made its final flight prior to retirement on July 30, from Eglin Air Force Base, Florida. The pilot, Major Ryan Stec, used the callsign 'Quell 2' for the mission, which was also flown as a memorial to Major James Duricy, who died on April 30, 2002, after ejecting from a similar 40th FLTS aircraft, 80-0022, while testing a then-new AIM-9X missile. For '025's final sortie, the aircraft flew in the same configuration with an AIM-9X and used the same callsign as that used on Duricy's fatal mission.

After landing back at Eglin, aircraft '025 was welcomed by a traditional water cannon salute from the base fire department. Due to the aircraft's age and the number of hours it has flown, the F-15C is one of the first to be taken out of the line-up and retired. It is scheduled to be replaced by an F-15EX, to continue the test mission with the 40th FLTS. The retired aircraft will eventually be stored with the 309th Aerospace Maintenance and Regeneration Group, which is located at Davis-Monthan Air Force Base in Arizona.



USAF/40th Flight Test Squadron takes off from Eglin AFB, Florida, on July 30, for its final flight USAF/1st Lt Karissa Rodriguez

In Brief

■ SIKORSKY AIRCRAFT was awarded a $53,895,498 modification to an earlier contract by US Army Contracting Command on August 26 for production of UH-60M Black Hawks. An estimated completion date was given as June 30, 2022. The order is financed by fiscal year 2022 special funds but no further details of the contract were provided.

Argentine Air Force takes delivery of C-12B Huron

AFTER A slight delay, the first of ten former US Navy TC-12B/UC-12B Hurons for the Fuerza Aérea Argentina (FAA – Argentine Air Force) has been delivered. The aircraft, UC-12B TC-117 (c/n BJ-59, ex BuAer 161511), arrived at El Palomar Air Base, Buenos Aires, home of I Brigada Aérea (BA), on the afternoon of August 25 after undergoing a major refurbishment in Alabama, where it had reflown on July 2.

The aircraft was in a civilian-style colour scheme, but already wore FAA roundels and markings, along with II Brigada Aérea titles.

Over the following few days, it was due to be repainted in the standard FAA overall low-visibility grey military scheme at the Area Material Río Cuarto facility in Córdoba.

It was then due to be officially delivered to II BA at Paraná, Entre Rios, where it will be used for twin-engine conversion training. In the coming months, it will be followed by nine TC-12Bs.

All ten aircraft had previously been in storage with the 309th Aerospace Maintenance and Regeneration Group at Davis-Monthan Air Force Base, Arizona, where the nine TC-12Bs had arrived between March and May 2017, while the UC-12B joined them in July 2019.

Four of the aircraft will be assigned to the new Curso de Estandarización de Procedimientos de Aviadores de Transporte (CEPAT – Course on Standardization of Procedures for Transport Aircrew) squadron at II BA. Previously, this course was performed by the DHC-6 Twin Otters of IX Brigada Aérea at Comodoro Rivadavia but it is expected to begin at Paraná by mid-2022, after training of the new Huron's instructors has been completed. The rest of the 'new' TC-12Bs will be distributed around other units for liaison tasks.

These will comprise III BA at Reconquista, V BA at Villa Reynolds and VI BA at Tandil, which will each receive one aircraft, as will the Escuela de Aviación Militar in Córdoba. The remaining two aircraft will be allocated to the Base Aérea de Morón Escuadrón Aéreo.

Horacio J Clariá



New Fuerza Aérea Argentina UC-12B Huron TC-117 arriving at El Palomar Air Base, Buenos Aires, on the afternoon of August 25 following its delivery flight from the US *Gastón Hernández via Horacio J Clariá*

Argentine Air Force TC-12B/UC-12Bs

Serial	C/n	Year built	Ex-USN Bu No	AMARG arrival date
TC-110	BJ-12	1980	161196	May 18, 2017
TC-111	BJ-31	1980	161314	April 26, 2017
TC-112	BJ-33	1980	161316	April 26, 2017
TC-113	BJ-40	1981	161323	March 15, 2017
TC-114	BJ-41	1981	161324	May 17, 2017
TC-115	BJ-55	1981	161507	May 18, 2017
TC-116	BJ-56	1981	161508	April 19, 2017
TC-117	BJ-59	1982	161511	July 24, 2019
TC-118	BJ-62	1982	161514	May 18, 2017
TC-119	BJ-66	1982	161518	April 12, 2017

Notes: *All are TC-12B except TC-117, which is a UC-12B. TC-115/117/119 left AMARG by February 2021, with TC-118 following by March 2021 and TC-112/113/114 in August 2021*

Two ex-USAF C-130H Hercules go to Colombia

A FURTHER two ex-US Air Force C-130H Hercules have been delivered to the Fuerza Aérea Colombiana (FAC – Colombian Air Force), which officially received them on August 3. The aircraft, FAC1017 and FAC1018, will initially be handed over to the FAC's Comando Aéreo de Mantenimiento (CAMAN – Air Maintenance Command) which will carry out a heavy maintenance programme before the aircraft enter service. This work will be undertaken by the Corporácion de la Industria Aeronáutica de Colombia SA (CIAC) at El Dorado, Bogotà.

On completion, the aircraft will join Grupo de Transporte Aéreo 81's Escuadrón de Transporte 811 at El Dorado. This will enable the FAC to retire its sole C-130B, FAC1001.

This is the third recent C-130H acquisition through the US Excess Defense Articles programme. The first, FAC1016 (c/n 5014, ex USAF/83-0488), was delivered in September last year. The previous identities of the two newly delivered examples are not yet known.

US Coast Guard relief missions after Haiti earthquake

US Coast Guard MH-60T Jayhawk 6033 from Air Station Clearwater lands after a medevac flight in Port au Prince, Haiti, on August 23. The Coast Guard conducted humanitarian efforts in impacted areas of Haiti following a magnitude 7.2 earthquake on August 14 *USCG/Petty Officer 3rd Class Ryan Estrada*



French Reapers operational with laser-guided GBU-12

The Armée de l'Air et de l'Espace (AAE – French Air and Space Force) announced on August 24 that it has for the first time launched a GBU-12 laser-guided munition from an MQ-9A Reaper Block 5 during an operational mission. The launch took place on August 17 during an Operation Barkhane sortie in Niger, marking a further step to achieving full operational capability with the Block 5 UAV.

The Block 5 system offers more powerful intelligence, surveillance and reconnaissance (ISR) sensors and paves the way for improved kinetic capabilities. Reaper Block 5 now has a new operational capability following its GBU 12 ammunition firing qualification. A first experimental campaign was carried out from March to May 2021 from France's Base Aérienne Projetée (BAP – Forward Operating Base) at Niamey in Niger to test the new Block 5 system in an operational context.

A second campaign took place in July to test the carriage and firing capacity of the GBU-12 on the Block 5 MQ-9A. The armed Reaper Block 5 is now being employed in the Bande Sahélo-Saharienne (BSS – Sahelo-Saharan Strip). The AAE thus has a UAV with better video and radar quality, improved connectivity, and more versatile weapon capacity.

The next milestones will validate the Reaper Block 5's carriage of the GBU-49 and Hellfire missile.

Below: ***French Air Force MQ-9A Block 5 Reaper serial number 542 taxies out at Niamey, Niger, armed with GBU-12 laser-guided munitions*** *État-Major des Armées*



Next batch of Nigerian A-29Bs being prepared for delivery

SIERRA NEVADA Corporation (SNC) is preparing the remaining six Nigerian Air Force (NAF) Embraer A-29B Super Tucanos for delivery later this year. They are being worked on in SNC's facility at Denver's Centennial Airport in Colorado. While test flying, they have increasingly been seen visiting Tulsa International Airport, Oklahoma, where 19-2042 was noted on July 29, followed by 19-2041 on August 20.

The first six were delivered to Kano, Nigeria, on July 22– see *First six Nigerian A-29Bs delivered*, September, p21. Full serial details for those aircraft are now known (see table). The remaining six comprise FMS serials 19-2035, 19-2037, 19-2041, 19-2042, 19-2043 and 19-2044.

These are expected to become, respectively, NAF847, NAF849, NAF853, NAF854, NAF855 and NAF856.

NAF Serial	FMS serial
NAF845	19-2033
NAF846	19-2034
NAF848	19-2036
NAF850	19-0238
NAF851	19-2039
NAF852	19-2040



Above: ***Nigerian Air Force Embraer A-29B Super Tucano, wearing US Air Force FMS serial 19-2041, visiting Tulsa International Airport, Oklahoma, on August 20. The flight originated from Denver's Centennial Airport in Colorado, where Sierra Nevada Corporation is preparing the aircraft for delivery*** *Ralph Duenas*

Three G120TPs received by Kenyan Air Force

AN ADDITIONAL three Grob G120TPs have been delivered to the Kenyan Air Force (KAF).

After leaving the factory at Mindelheim in Germany they routed via Crete, Egypt, Djibouti and Addis Ababa, Ethiopia, before arriving in Kenya on August 19.

Although no order from the KAF has been officially announced, two G120TPs were confirmed in service with the Flying Training School's Training Squadron at Laikipia Air Base, Nanyuki, by May this year – see New Kenyan Grob 120TP, July, p24.

It is now understood that the initial delivery comprised three aircraft, although their precise arrival date is unknown.

A further three followed more recently and with the latest batch, the KAF now has nine of the type in service.

The KAF has previously taken delivery of six of the earlier G120A-K model, which arrived in November and December 2013.

One has since been lost in a crash on March 28, 2018, although both crew escaped with minor injuries – see *AFM* Attrition, May 2018, on p93.

The five surviving aircraft all continue in use with the Training Squadron at Laikipia, although ultimately it is expected that the new G120TPs will replace them.

Israel's Scorpion squadron moves to Ramat David

EXECUTION OF the latest part of the Israeli Air Force (IAF) 'Momentum' plan got under way on August 17 with an early morning departure from Hatzor Air Base to Ramat David Air Base of the aircraft of 105 'Scorpion' Squadron. These comprised the survivors of 30 Block 40 F-16D Barak (Lightning) fighters supplied to Israel in the late 1980s under the Peace Marble II programme.

These join sister unit 101 'First Fighter' Squadron, which had moved from Hatzor to Ramat David on June 21 – see *Israeli 101 Sqn F-16s move to Ramat David*, August, p23. For the time being, 109 'The Valley' Squadron (flying Block 30 F-16Ds) is also flying alongside them at Ramat David, with the three squadrons making up the only Barak wing in the IAF.

Meanwhile, Hatzor will continue to be developed as a Special Forces base with the next generation of unmanned aerial vehicles (UAVs) utilising the existing facilities.

No 115 'Flying Dragon' Squadron at Ovda will continue using Block 30 F-16Cs until this year's Blue Flag exercise in October with all Barak servicing and support concentrated at Ramat David. A similar consolidation plan is underway for 107 'Knights of the Orange Tail' Squadron flying the F-16I Sufa (Storm) which will move to Ramon Air Base to join the rest of the Sufa fleet, releasing space at Hatzerim for the proposed F-15EX squadron.

David Weinrich



The first Qatar Emiri Air Force (QEAF) F-15QA (Qatar Advanced) Ababil, QA500, during the formal unveiling in St Louis on August 25 *Governor Mike Parson*

Qatar's F-15QA Ababil officially rolled out

A ROLL-OUT ceremony for the first Qatar Emiri Air Force (QEAF) F-15QA, serial QA500, was held at Boeing's facility in St Louis, Missouri, on August 25. The event, held by Boeing in collaboration with the US Air Force and QEAF, also marked the official naming of the new fighter as the Ababil, after the legendary bird known as Qatar's 'guardian of the skies'.

Speaking at the ceremony, Lt Gen Greg Guillot, commander of the 9th Air Force, said: "The rollout of the F-15QA is momentous, not just in terms of capability but also in terms of the enhanced partnership it represents. The relationship the United States shares with Qatar is critical to the stability and security of the central command area of responsibility and we are grateful for our coalition partner's continued focus on building interoperability and combined readiness. It is a privilege and honour to stand with our Qatari counterparts this day and every day."

The first batch of F-15QAs will be ferried to Qatar later this year, following the completion of pre-delivery pilot training. The latter has been under way for some time, with the QEAF F-15QAs operating out of MidAmerica Airport, Illinois. The first QEAF F-15QA made its maiden flight from St Louis on April 13, 2020.

Boeing has been providing maintenance and logistics support for the QEAF during pre-delivery pilot training, which began earlier this year. In addition, Boeing will establish and operate an aircrew and maintenance training centre for the QEAF at Al Udeid Air Base in Qatar through to 2024, while also providing in-country spares and logistics support once aircraft are delivered.

The number of aircraft ordered by Qatar has always been quoted by Boeing as 36, whereas various official US Department of Defense documents repeatedly refer to 48 being on order. When the US Defense Security Cooperation Agency initially announced details of the deal on November 17, 2016, the total planned acquisition was given as 72 aircraft.

Joint Israeli-US Desert Falcon exercise



Israeli Air Force (IAF) F-16C 355 from 115 Squadron 'Flying Dragon'; US Air Force F-15E Strike Eagle 91-0306 'LN' from the 48th Fighter Wing/494th Fighter Squadron 'Panthers', and an IAF F-15B Eagle from 133 Squadron 'Knights of the Twin Tail' fly in formation during the week-long Exercise Desert Eagle, which was held at Ovda Air Base and ended on August 10 *Israeli AF*

First contract signed for modernised Ka-52M

RUSSIAN HELICOPTERS announced on August 24 that it had agreed a contract with the Ministry of Defense of the Russian Federation to supply the first modernised Ka-52M attack helicopters. The deal, which was signed at the international military and technical forum 'Army-2021' held at Kubinka Air Base near Moscow from August 22-28, will see the first of these helicopters delivered as early as 2022.

According to reports, the deal covers initial batches totalling 30 helicopters for production in 2022 and 2023. Scheduled deliveries for these modernised helicopters will begin after state joint tests, which began in August, have been completed. It is the first contract as part of an overall framework deal announced in 2018 and which incorporates an eventual overall purchase of 114 Ka-52Ms. First flight of the prototype Ka-52M at the Arsenyev Aviation Company (AAC) 'Progress' aviation production plant in Arsenyev, Primorye, had been announced on August 10, 2020.

Andrey Boginsky, Director General of Russian Helicopters Holding Company, said: "The Ka-52 is one of the best attack helicopters in the world but even the best aircraft needs timely modernisation, which will expand its combat capabilities. With the updated version development, our designers drew on the experience of the Alligator's operation, including in real combat situations. Therefore, everything in the modernised attack helicopter is aimed at improving combat effectiveness in all weather conditions. Under an agreement with the Russian Ministry of Defense, preparations for serial production have already begun at the AAC 'Progress' facility in the Primorye."

The Ka-52M has received modernised avionics, which are equipped with more powerful computers for better performance. With its support, the weapons application capabilities have been expanded, including for night-time operating conditions.

The helicopter has also integrated and tested advanced long-range missiles. The Ka-52M has been adapted to work in conjunction with UAVs. The data obtained from the UAVs will assist the crew in increasing situational awareness on the battlefield and help to significantly improve intelligence gathering at a greater distance.

To increase the helicopter's efficiency, intensive work is underway to install a new active electronically scanned array radar, the Zaslon V006 Rezets (Cutter), which is currently still under development by the St Petersburg company. It will replace the Phazotron-NIIR radar currently fitted to the Ka-52. A trial version of the radar is already being tested in a Ka-52K.

A new electro-optical sight, the OES-52 developed by Moscow-based NPK SPP, will also be installed. This houses a laser rangefinder/designator, laser beam riding for anti-tank guided missiles, laser spot tracker, thermal imaging camera and a TV camera. It replaces the heavier GOES-451 fitted on earlier Ka-52s, while also doubling target detection and recognition range. The accuracy of cannon firing is also improved with the new equipment.

The cockpit interior has been modernised to make it more ergonomic, while a more powerful heating element is incorporated into the main rotors for improved operations in extreme cold and the undercarriage has been made more robust to increase resistance to possible damage in heavy landings. The helicopter is also equipped with an upgraded BLC (On-Board Load Control System) and the combat radius has been increased.

MiG-31 and Tu-95MS upgrades agreed

MODERNISATION CONTRACTS were signed at the international military and technical forum 'Army-2021,' held at Kubinka Air Base near Moscow from August 22-28, for the Russian Air Force's MiG-31 fighter-interceptors and Tupolev Tu-95MS strategic missile carriers. The deals between United Aircraft Corporation subsidiary companies and the Ministry of Defense of the Russian Federation were announced on August 24.

A state contract for the deep modernisation of Tu-95MS to Tu-95MSM standard was signed by the Deputy Minister of Defense of the Russian Federation Alexei Krivoruchko and the Managing Director of Tupolev PJSC Vadim Korolev. Work on the Tu-95MS is carried out jointly by PJSC Tupolev and PJSC TANTK G M Beriev. As part of an extensive upgrade, modern equipment and systems are installed on the Tu-95MS to bring it to the Tu-95MSM configuration. Work includes upgraded Kuznetsov NK-12MPM turboprops with AV-60T propellers, new Novella HB1.021 phased-array radar, an SOI-021 information display system and Meteor-NM2 self-defence system.

In addition, two state contracts were signed by the Russian MoD and RSK MiG. One involves the overhaul and modernisation of MiG-31s to MiG-31K standard to carry the Kh-47M2 Kinzhal (Dagger) hypersonic missiles (see Putin's Prize, AFM Sept, p46-48). The second is a government contract for the repair of MiG-31 aircraft with modernisation to the level of the MiG-31BM. The documents were signed by the Deputy Minister of Defense Alexei Krivoruchko and the managing director of the MiG corporation **Andrey Gerasimchuk.**



PLAAF Y-20As support Aviadarts 2021

These two Chinese People's Liberation Army Air Force (PLAAF) Xian Y-20As, 20041 and 20042, from the 13th Transport Division/37th Air Transport Regiment at Kaifeng, were seen on August 25 providing support to the PLAAF contingent at Dyagilevo Airport near Ryazan, Russia *Russian MOD*

Singapore's prototype Advanced A330 MRTT undergoes final tests

REPUBLIC OF Singapore Air Force (RSAF) Airbus A330 MRTT serial number 764, which has been converted as a prototype of the automatic air-to-air refuelling (A3R) A330 SMART MRTT, has returned to Spain for completion of its trials programme.

The aircraft made a short positioning flight from the Airbus facility at Madrid-Barajas Airport to the company's facility at Getafe, Spain, on August 27. It has been modified to develop the new fully A3R capability, as well as innovations such as an enhanced vision system for night-time covert operations and improved sensors in a move towards predictive maintenance.

On February 12, 2020, Airbus and Singapore had announced an agreement to collaborate on the development, certification and implementation of the A3R capability, along with enhanced maintenance solutions for the type. Initial trials were conducted in Singapore in early 2021 using the SMART MRTT prototype to refuel several receivers from the RSAF using the new A3R system. On May 20, 2021, Airbus announced that development of the system had reached its conclusion and that certification should be achieved by the end of the year - since then the aircraft has been moved to Spain in order to continue with and complete the test and certification process.

The A3R system requires no additional equipment on the receiver and is intended to reduce air refuelling operator (ARO) workload, improve safety and optimise the rate of air-to-air refuelling (AAR) transfer in operational conditions to maximise aerial superiority. Once the A3R system is activated by the ARO, the Boom Flight Control System becomes fully automated and progresses to transfer fuel upon contact with the receiver. During this process, the ARO simply monitors the operation. In the event of an anomaly due to receiver stability deviations or malfunctions on the tanker, the A3R system is able to disconnect and/or clear the Boom away from the receiver safely.

On the receiver end, pilots closing into the tanker take visual cues from the automated Pilot Director Lights (PDL). This feature allows for more efficient operations, with smoother transitions and minimises time during the coupled state. The A3R development paves the way towards a fully autonomous aerial refuelling operation.

Roberto Yáñez



Republic of Singapore Air Force A330 MRTT 764, the SMART MRTT prototype, landing at Getafe, Spain, on August 28 after a positioning flight from Madrid-Barajas Airport *Roberto Yáñez*



TNI-AD Bell 412EP takes part in Garuda Shield 21

US Army Soldiers with the 1st Battalion, 21st Infantry Regiment, 2nd Infantry Brigade Combat Team, 25th Infantry Division, conduct an air assault mission on Tentara Nasional Indonesia-Angkatan Darat (TNI-AD – Indonesian Army) Bell 412EP HA-5165 at Baturaja Training Area on August 4 during Garuda Shield 21. Garuda Shield 21 is a two-week joint-exercise between the US Army and TNI-AD intended to enhance the jungle warfare ability of both forces *US Army/Staff Sgt Thomas Calvert*

Lockheed Martin is awarded five-year Indian C-130J support contract

LOCKHEED MARTIN announced on August 24 that it has been awarded a US$328.8m, five-year contract from the Indian Air Force (IAF) to provide dedicated and comprehensive support for the IAF's fleet of 12 C-130J-30 Super Hercules. Through this Follow On Support (FOS) II contract, Lockheed Martin teams manage the programme, logistics and engineering support elements necessary to sustain the IAF's C-130J-30 fleet.

The contract spans a five-year-period, is a Direct Commercial Sale and is a continuation of a prior five-year FOS I contract. The FOS II contract includes sustainment efforts for the IAF's entire Super Hercules fleet, as well as extended options including support for the C-130J airframe, Contractor Furnished Equipment (CFE), peculiar and common spareable items, engines, propellers, software, publication services, ground handling equipment (GHE), ground support equipment (GSE) and test equipment.

Additionally, through the FOS II contract, five C-130Js will undergo 12-year servicing (depot maintenance) at a Lockheed Martin-approved Heavy Maintenance Center (HMC) beginning in 2022.

US State Dept abandons seven CH-46Es in Kabul

SEVEN CH-46E Sea Knight helicopters operated by the US Department of State Air Wing (DoSAW) have been abandoned in Afghanistan. They had most recently been used on August 15 to ferry personnel evacuating the US Embassy in Kabul out to Kabul's Hamid Karzai International Airport to board outbound flights.

Following a request on their status, a background statement provided to *AFM* by a State Department official on August 25 said: "We can confirm that the Department left seven CH-46 helicopters behind in Afghanistan which were rendered inoperable. These helicopters were already being phased out of the Department's inventory and were slated for eventual destruction due to age and supportability issues. As of August 15, 2021, the Department no longer operates any aircraft in Afghanistan."

The elderly CH-46s are all former US Marine Corps (USMC) examples, which were extensively refurbished before entering DoSAW service from 2012. In 2018, there were 23 in the DoSAW inventory, but by August this year, only 11 were still officially registered to the Department of State, including those now left to their fate in Afghanistan. It is not known whether any of the other CH-46s remain operational, but it seems most likely that the majority are now out of service and the Kabul embassy evacuation could well have been their swansong.



US Department of State Air Wing CH-46E Sea Knight N431WR in the US Embassy compound in Kabul, Afghanistan, during then Secretary of State Mike Pompeo's visit on March 23, 2020. Note the 7.62mm M240D machine gun in the forward cabin door and the decoy flare dispensers. This is most likely one of seven left behind after evacuating Embassy staff from that very same compound on August 15 *US State Dept/Ronny Przysucha*

The Sea Knight is the same type used by the USMC in the evacuation of the US Embassy following the fall of Saigon in South Vietnam in 1975. Coincidentally, one of the DoSAW CH-46Es used in the recent Kabul evacuation was N38TU, which was formerly BuAer 154038 with the USMC. This was one of the helicopters deployed on the USS Hancock (CV-19) in 1975 to support evacuation of Saigon in Operation Frequent Wind.

Japanese KC-46A tanker finishes first refuelling sortie

THE INITIAL Boeing KC-46A Pegasus tanker for the Japan Air Self-Defense Force (JASDF) has successfully refuelled another aircraft in-flight for the first time during a recent test sortie over Washington state. Boeing announced the recent completion of this milestone on August 16, saying that the JASDF tanker successfully transferred fuel to another KC-46A and was itself refuelled during the test flight. Japan is the first export customer for the type and is scheduled to receive its first of four examples before the end of this year.



Japan Air Self-Defense Force Boeing KC-46A Pegasus 14-3611 refuels USAF KC-46A 19-46059 on July 20 over Washington state *Boeing/Kevin Flynn*

Japan became the first export customer for the KC-46 on December 22, 2017, when the US Air Force (USAF) awarded Boeing a US$279m contract to produce and deliver the initial aircraft to the JASDF. This order was placed after the Japanese Ministry of Defence (MOD) selected the platform as the winner of its KC-X aerial refuelling competition.

A second example for Japan was ordered on December 6, 2018, and is currently being manufactured at Boeing's KC-46 production facility in Everett, Washington. On October 29, 2020, the company was awarded a US$342.1m contract by the USAF to produce an additional two aircraft for Japan, bringing the order total to four.

When operational, Japan's KC-46A fleet will be capable of refuelling aircraft from the JASDF, USAF, US Marine Corps (USMC) and US Navy. Additionally, Boeing's Japan-based partners are responsible for producing 16% of the tanker's airframe structure.

Former US Army Black Hawk to be fire-fighter in South Australia

A SECOND former US Army UH-60A Black Hawk has been acquired by Aerotech Australia, which will use it in South Australia for aerial fire-fighting during the fire season. The helicopter arrived at Parafield Airport, South Australia, on August 15.

Although civilian registration VH-UHG was applied to the cabin doors, it was still in full US Army medevac colours with 'IN-NG' titles on the tail and carrying serial 82-23761.

After being shipped by sea from the US, it had arrived at the docks in Melbourne, Victoria, on August 12, then went initially to Melbourne's Essendon Airport before departing from there for Parafield on August 15.

The helicopter had previously been operated by C Company, 2-238th AVN, of the Indiana Army National Guard at Gary Airport, Indiana, but was latterly stored at Huntsville, Alabama, until being put up for sale by tender in December 2020. Following sale, it was registered on April 16 as N360AU to Pickering Aviation Inc of Denton, Texas, then cancelled on July 26 following onward sale in Australia.

The first Aerotech Australia UH-60A was another former US Army example, 80-23475, which was put up for auction in March 2020, then registered as N260AU on May 28, 2020, also to Pickering Aviation.

It was then cancelled on March 12, 2021, following sale in Australia.

Its drab military scheme has now been replaced by a smart red and blue scheme with white trim for its new civilian fire-fighting role.



Former US Army UH-60A Black Hawk VH-UHG, still also wearing its previous military serial 82-23761, arriving at Parafield Airport, South Australia, on August 15 after being shipped by sea from the US Nathan Rundle

Simulator upgrade for RAAF Hawk

CAE AUSTRALIA has been awarded a contract by Australia's Capability Acquisition and Sustainment Group to support the upgrade of the Royal Australian Air Force's (RAAF's) three full-mission Hawk Mk127 simulators. The deal, announced on August 24, involves integration of an eye tracking training system developed by Seeing Machines.

Seeing Machines will collaborate with CAE Australia to install and integrate the training system, which features precision eye-tracking technology on the RAAF Hawk simulators for the lead-in fighter training programme. This technology will improve aircrew training by providing objective insights and detailed data on where training pilots are looking during training scenarios in the simulator.

CAE Australia, along with Seeing Machines and the RAAF, have proved the effectiveness of the eye-tracking capabilities over the past year during a research programme at RAAF Base Williamtown, New South Wales, where the system was installed on one of the Hawk Mk127 full-mission systems for the 78 Wing. The Hawks at Williamtown are flown by the Wing's 76 Squadron.

Matthew Sibree, Managing Director, Indo-Pacific, CAE said "This is another great example of how government and industry can partner to deliver enhanced training and operational capability. We are pleased to collaborate with Seeing Machines to improve the training programme that helps prepare the next-generation fighter pilots for the Royal Australian Air Force."

CAE Australia will hold overall responsibility for upgrading two of the three Hawk Mk 127 simulators at RAAF Base Williamtown and the third at RAAF Base Pearce, Western Australia. CAE Australia currently provides training support to the RAAF on its lead-in fighter training programme, including services such as provision of classroom and simulator instructors.

Viper makes cross-deck landing during navy exercise



A US Marine Corps AH-1Z Viper from the San Antonio-class amphibious transport dock USS New Orleans (LPD-18) takes off from the Royal Australian Navy Anzac-class frigate HMAS Ballarat (FFH-155) on August 8 as part of a cross-deck landing activity during the US Navy-led Large Scale Exercise 2021 in the Western Pacific Commonwealth of Australia/LSIS Ernesto Sanchez



Nuclear defen

The French Strategic Air Forces and Nuclear Naval Air Force have served as the backbone of the nation's nuclear deterrence for more than half a century. **Jean François Auran** explores the evolution of France's steadfast atomic protectors and how the capability will be advanced in the coming years

On February 4, 2019, a crew from EC 2/4 'La Fayette' took off from Saint Dizier AB (BA 113) for an 11-hour mission that covered all of the characteristics of a nuclear deterrence sortie: high-altitude flight; successive refuelling by French tankers and low-altitude penetration into highly defended areas. An inert ASMP-A missile was launched on a test area in Biscarrosse, southwest France
AAE/Laure-Anne Maucorps

ders





The Armée de l'Air et de l'Espace (AAE, French Air and Space Force) is implementing the airborne component of its nuclear deterrence under the orders of the President of the French Republic, Emmanuel Macron.

Constituted in 1964, the Forces Aériennes Stratégiques (FAS, Strategic Air Forces) are a formidable tool that have enabled the air force to progress collectively. Despite the lack of aircraft exclusively dedicated to this tasking, France's nuclear mission continues.

A permanent posture

Deterrence is the cornerstone of France's defence. It aims to discourage any tentative forms of aggression against the country or its strategic interests by allowing any potential adversary to foresee that their unacceptable actions could result in a nuclear response from France.

The French military's airborne and maritime components ensure that the country's nuclear deterrence remains on a permanent posture. They are inseparable and complementary, supported by a set of conventional capacities. The FAS and Force Aéronavale Nucléaire (FANu, Nuclear Naval Air Force) – which is embarked aboard France's sole aircraft carrier, the FS *Charles de Gaulle* (R91) – constitutes the airborne component.

Today, France is the only European country to boast its own airborne nuclear deterrence capability. While other NATO nations have aerial vectors that are capable of delivering nuclear strikes – such as Germany and the Netherlands – they cannot independently decide to use them as the weapons remain exclusive property of the US.

A brief history

France has employed nuclear weapons under 'double lock' for several decades within the NATO framework. From 1963 to 1964, North American F-100D/F Super Sabre fighters belonging to the air force's 11e Escadre de Chasse (11e EC, 11th Fighter Squadron) based at Bremgarten and Lahr-Hugsweier, both located in Baden-Württemberg, Germany, were equipped with US-made Mk.28 (now B28) thermonuclear bombs.

The nuclear force – known as Force de Frappe (Strike Force) – was born under the direction of then-President of the French Republic, Gen Charles de Gaulle. The first component to be operational was the airborne one. Created by decree on January 14, 1964, the FAS has continued to carry out this dissuasion mission without interruption. In October 2019, the force celebrated its 55th anniversary and 20,000 days of continuous nuclear alert.

The first aircraft of the FAS was the Dassault Mirage IV-A, which was specifically developed to be equipped with France's national nuclear weapon. On October 8, 1964, the Mirage IV-As conducted their first alert with the 60kt (kiloton) AN-11 atomic fission bomb. The French nuclear industry produced 40 copies of the munition between 1963 and 1967.

The 70kt AN-22 – which was lighter with improved precision and security – began replacing the AN-11 from 1967. The Mirage formed a weapons system with the Boeing C-135F Stratotankers that were acquired from the US in 1964.

By June 1966, 45 Mirage IV bombers were in service with the FAS. Nine Mirages were on alert at 15 minutes' notice, with three C-135Fs and 27 additional aircraft on watch, given an hour's notice. The bomber squadrons also had two Lockheed T-33 Shooting Stars for liaison duties. By 1968, 62 aircraft equipped the three bomber squadrons.

Several years later, France acquired tactical nuclear forces, whose mission was to warn a potential aggressor. While the Mirage IVs carried out bombardments beyond the Iron Curtain, the Dassault Mirage IIIEs and the more limited range SEPECAT Jaguars would receive much closer targets.

From 1973, the Force Aérienne Tactique (FATAC, Tactical Air Force) had two Mirage IIIE squadrons, equipped with AN-52 nuclear bombs. Additionally, Jaguar units at Saint Dizier – Escadron de Chasse 1/7 (EC 1/7, Fighter Squadron 1/7) 'Provence' and EC 3/7 'Languedoc' – also employed the AN-52. Two-thirds of the AN-52s fitted to these aircraft had a blast yield of 10kt, while the others were 25kt.

The French bases that accommodated nuclear units under the FAS underwent profound modifications to create Dépôts d'Armes et de Munitions Spéciales (DAMS, Arms and Special Ammunition Depots) to store nuclear weapons. The last Mirage IIIE was withdrawn from air force service in 1988.

FAS command had long been aware of the increased difficulty of penetrating the USSR's air defence network following the introduction of the SA-4 (NATO reporting name: *Ganef*) and SA-6 *Gainful* surface-to-air missile (SAM) systems. As early as the 1970s, the effectiveness of the airborne component was questioned because of its limited capacity to penetrate Soviet airspace, along with the small number of vulnerable tankers that supported the mission.

In 1979, the air force decided to modernise 18 Mirage IV-As to IVP standard, allowing the platform to carry the newly designed 100 to 300kt Air-Sol Moyenne Portée (ASMP) air-launched nuclear cruise missile. The





Above: ***The Dassault Mirage IV is a French strategic bomber that entered operational service in 1964. It formed the backbone of FAS operations until the mission was taken over by the Mirage 2000N. The type was officially withdrawn from service on June 23, 2005*** *Nicolas Archer*
Right: ***From 1996, the FAS relied on three Dassault Mirage 2000N units in order to continue with the nuclear alert mission. The type has since been replaced in this role by the Rafale. This example belonged to EC 2/4 'La Fayette'*** *Khalem Chapman*

Rafale F3-R

The FAS is now equipped with the Rafale F3-R. EC 1/4 'Gascogne' (code: 113-IA to 113-IZ) and EC 2/4 'La Fayette' (code: 4-XX) are the two air force combat units assigned to the nuclear alert mission. The Aéronautique Navale's (French Fleet Air Arm's) Flottille 11F and Flottille 12F – based at Landivisiau Naval Air Base in Brittany – are also ASMP-A qualified.

Along with the AAE as a whole, the Rafale's availability remains to be an issue, despite a recent reorganisation of the type's aeronautical support. According to information provided during a parliamentary hearing, an average of 25 Rafales can fly from Saint Dizier. Operational missions required half of them and the active maintenance of crews.

The squadrons must also ensure the territory's security, carry out reconnaissance missions and intervene in external detachments in Jordan, for instance. EC 2/4 'La Fayette' – having highly distinguished itself during the Libya campaign in 2011 (Operation Harmattan) – received the Cross of Military Valour, with citation to the Air Force Order. In 2017, the FAS Rafales covered air defence alert operations for 13 weeks.

aircraft's navigation systems were also updated in the form of the Iguana radar and a SAGEM inertial navigation unit.

In 1978, France launched the Mirage 2000N programme. Based on a two-seat Mirage 2000 – but with reinforced wings – it was fitted with an advanced navigation and attack system that was organised around the Antilope-5 radar. In total, 75 aircraft were ordered, comprising 31 M2000N K1s (only equipped with ASMP) and 44 2000N K2s (which carried a vast panoply of conventional weapons).

The K3 variant was available in 2003 for the integration of the ASMP-A (Ameliorated) missile (see panel). The upgrade provided the Mirage 2000N with a number of newer, advanced systems, as well as the Thales Reco-NG reconnaissance pod. It was able to operate at extremely low altitudes at high speed (600kts). The 4e EC was one of the first squadrons to be equipped with the 2000N and in July 1989, EC 2/4 'La Fayette' took over the alert with the type, equipped with the ASMP.

In summer 1996, the Mirage IV bombers abandoned their nuclear mission, switching to a strategic reconnaissance role. From then, the airborne component relied on its three Mirage 2000N squadrons. Base Aérienne 116 (BA 116, Air Base 116)/Luxeuil-Saint Sauveur Air Base (AB) in France's Franche-Comté region and BA 125/ Istres-Le Tubé AB in Bouches-du-Rhône were home to 60 2000Ns.

The Mirage 2000N has now been replaced by the Dassault Rafale (see panel), which will bring the extension and penetration capabilities of enemy defences to the highest level available.

On March 21, 2008, then-President of the French Republic, Nicholas Sarkozy, announced that the FAS forces would be reduced by one third. This measure came into effect in 2011.

'FAS aircraft mainly participate in conventional missions, which account for more than 90% of their overall air activity'

Today's nuclear force

The FAS has approximately 2,000 personnel who have been maintaining the nuclear alert mission since 1964 under the Chief of Staff of the Armed Forces. These men and women prepare employment plans, operational directives and carry out the necessary operations, if required. When nuclear forces are active, the FAS general commanding officer is responsible for putting the assets into an operational condition.

It also supports the FANu by conducting nuclear weapon transport missions and implementing specific transmission means to benefit the two deterrence components. FAS aircraft mainly participate in conventional missions, which account for more than 90% of their overall air activity.

The FAS commanding officer has staff at BA 107/Vélizy-Villacoublay AB, near Paris, as well as at an operations centre of the Commandement des Forces Aérienne Stratégiques (COFAS, Command Air Forces Strategic) within the Taverny air element. This ensures there is permanent capacity for an



A Rafale B from EC 2/4 'La Fayette' equipped with an inert ASMP-A missile flies alongside a tanker aircraft during a training mission
AAE/Laure-Anne Maucorps



ASMP-A missile

After employing the AN-series of nuclear gravity bombs for a number of years, France developed a medium-range supersonic stand-off cruise missile equipped with a thermonuclear warhead (TN80 then TN81). It had to weigh approximately 900kg, with a master torque of less than 400mm for mounting on the Mirage III-E aircraft. Its adaptation for the Mirage IV – which was not initially envisaged – became a priority with the development of the IVP variant.

The munition is 5.38m long and is powered by a liquid-fuel ramjet engine, allowing it to reach speeds of Mach 3 over roughly 500km distances with three types of trajectories. From the beginning, the missile was designed to be interchangeable, meaning it can be adapted to fit all carriers. Adaptation work for the Mirage 2000 began in 1985 and the process was even trickier for the Super Étendard. The first firings of the missile from a Mirage IVP began in mid-1984.

The first production missile delivery occurred on August 29, 1985, when six DAMS were modified to accommodate the new missile. On May 1, 1986, the first Mirage IVP squadron took the nuclear alert mission with the ASMP. A total of 15 such aircraft were operational with the munition.

As early as 1989, the French Ministère des Armées (Ministry of the Armed Forces) conducted studies to improve the nuclear missile's capabilities, which ultimately led to the launch of the ASMP-A (Ameliorated) programme in 1997. On October 1, 2009, the weapon was declared operational on the Mirage 2000N K3 at Istres. This was followed by the Rafale F3 at Saint Dizier on July 1, 2010. In his speech at Istres on February 19, 2015, then-President of the French Republic, François Hollande, indicated that France had 54 operational ASMP-A missiles.

By 2016, the Ministère des Armées was already launching a renovation programme for the missile. The ASMPA-R (renovated) project will provide a new 300kt airborne thermonuclear warhead and increased range, when compared with the previous missile. The enhanced munition will make it possible for France to maintain technological superiority until at least 2035.

On December 9, 2020, the first launch of the MBDA-developed ASMPA-R took place, and the munition is scheduled to enter service in 2023. In 2016, France launched early studies on the ASMPA family's successor – the Air-Sol Nucléaire de 4e Génération (ASN4G, Fourth Generation Nuclear Air-Ground) missile. This work relates to both a new nuclear warhead, as well as its carrier.



Rafale B aircrew from EC 2/4 'La Fayette' prepare for a training sortie from Saint Dizier AB in northeastern France *AAE/Alexandre Beuzeboc*

immediate increase in power in the planning and execution of the nuclear mission.

It also has a weapons element transport unit stationed at BA 702/Avord AB in Central France. Three nuclear air bases accommodate a weapons depot and an alert zone for the Rafale. The flying assets comprise 50 two-seat Rafale Bs, which are located at BA 113/Saint Dizier-Robinson AB.

The 14 C-135F/KC-135R and three Airbus A330-243MRTT Phénix tankers (see panel, next page) are grouped in the 31e Escadre Aérienne de Ravitaillement de Transport Stratégique (31st EARTS, 31st Aerial Refuelling and Strategic Transport Wing). Stationed at Istres, the 31st EARTS was created on the FAS's 50th anniversary. The Stratotankers, and eventually the Phénix, have taken on the nuclear alert mission at Istres, Avord, Evreux (BA 105), Mont-de-Marsan (BA 118) and Solenzara (BA 126).

Naval brethren

The Marine Nationale (French Navy) provides a second airborne nuclear component. The original idea was to attack the powerful naval task forces around the USSR's Kirov-class battlecruisers and Kiev-class aircraft carriers with atomic weapons.

The decision to establish this naval-based nuclear air force was made in 1974 and became a reality four years later. FANu is linked to the FS *Charles de Gaulle*, without which it would not exist. Dassault-Breguet Super Étendards were the steed for this mission for a long time before the type was replaced by the Rafale M in 2016.

The admiral commanding the Force d'Action Navale (FAN, Naval Action Force) controls the FANu, which has its operations centre located at Six-Fours-les-Plages – a commune in the Var, southern France. Its role is to prepare and monitor the execution of orders issued by the President of the French Republic.

The flotillas train regularly as part of their participation in the FANu. France's Porte-Avions de Nouvelle Génération (PANG, New Generation Aircraft Carrier) – which is currently in development – should also be the vector of an onboard nuclear deterrence.

Nuclear exercises

In France, flying with a real, active nuclear weapon is prohibited during peacetime. In the 1960s, France conducted several live-fire exercises at the Pacific Proving Grounds (a nuclear test centre). Nuclear weapons had only been mounted on aircraft travelling a



A Rafale B equipped with the ASMP-A air-launched nuclear cruise missile is attended to by groundcrew inside a hardened aircraft shelter AAE Alexandre Beuzeboc

short distance. The air force also conducted exercises to validate atomic warheads and to test government clearance procedures.

Operation Tamouré – which concluded in July 1966 – saw a Mirage IV-A conduct a transatlantic flight in four steps to conduct a live test drop of the AN-22 bomb. This training sortie was supported by a C-135F from the Escadron de Ravitaillement en Vol 4/91 (ERV 4/91, Air Refuelling Squadron 4/91) 'Sologne'.

On July 25, 1974, the final live-fire test took place with the dropping of an AN-52 bomb from a Jaguar A. The munition detonated 20km southwest of Mururoa – an atoll in French Polynesia.

Nowadays, the training of aircrews for the nuclear mission does not include live-fire exercises, but there are a series of annual operations in which inert ASMP-A missiles are carried. These training sessions are called 'Banco' and 'Poker'.

Exercise 'Poker' is conducted four times a year. It is a high-intensity air operation that involves numerous aircraft and inert weapons. During the last edition, Saint Dizier-based Rafale Bs armed with denuclearised ASMP-A missiles carried out a penetration mission, supported by C-135F/KC-135R and Phénix tankers; a Boeing E-3F Sentry airborne warning and control system (AWACS, see panel) and Dassault Mirage 2000-5s from Luxeuil for protection. Aggressor aircraft played by a dozen Mont-de-Marsan-based Rafales and SAM systems were also involved.

Operation 'Banco' – which is carried out twice a year – concerns the ramping up of forces with the destocking of almost all nuclear warheads. After being mounted under the aircraft in the most realistic conditions as possible, the gunsmiths restock the munitions and store them in the depots again.

The FAS also conducts regular 'Minotaur' exercises. Unlike 'Poker', which only takes place over national territory, a nuclear raid of this type involves a long-range international deployment. In the last 'Minotaur' operation, five Rafales – accompanied by tankers and an E-3F – carried out an >8,000km air raid from the metropole to BA 118 in Djibouti, East Africa. The sortie lasted for more than ten hours. The three FAS Rafale Bs penetrated the opposing defences to simulate a missile strike, while the two single-seat Rafale Cs provided air cover for the raid.

Renewing the dissuasion

Conversations regarding the effectiveness of the airborne component are regularly raised because of continued advances in air defence technology and the arrival of fifth-generation fighters. Some

AWACS

The four E-3F Sentry AWACS of the air force's 36e Escadron de Détection et de Contrôle Aéroportés (EDCA 00.036, 36th Airborne Detection and Control Squadron) 'Berry' are also involved in the nuclear deterrence mission. They are essential to the 'nuclear raid' by sweeping a vast amount of airspace to detect and identify adversary aircraft at all altitudes. The E-3Fs, together with the tankers, form the link to the FAS operations centre.

In the near future, the French E-3Fs will be integrated with satellite-based Link-16 Joint Range Extension (JRE) datalink software. This new version of the datalink will allow the data obtained and shared by the Sentry to be sent directly back to mainland France, enabling the exchange of all tactical situations with strategic vectors without distance constraints.



AAE-operated Boeing KC-135R Stratotanker – serial 525 '31-CN' – deployed to Bamako Sénou, Mali, to support the French-led Operation Serval in September 2013. The air force's C-135FR/KC-135R and Airbus A330-243MRTT Phénix tankers are integral to the country's nuclear alert mission Jean François Auran



Conducted on December 15, 2020, Operation 'Minotaur' was a FAS power projection demonstration. Five Rafales (three Bs and two Cs) – accompanied by tankers and an E-3F – carried out an air raid on BA 118 in Djibouti from France. The mission covered more than 8,000km and lasted over ten hours AAE

would say the FAS has a high cost and a declining credibility in the face of newly developed air defence systems.

However, there are advantages, not least that the price tag associated with FAS is less than 10% of the costs relating to the submarine fleet operated by the Force Océanique Stratégique (FOST, Strategic Ocean Force). Britian elected to abandon its airborne nuclear component, opting instead to maintaining an at-sea submarine-based deterrence as long ago as 1993.

Nevertheless, France's airborne nuclear deterrence still boasts several advantages: global coverage; the ability to conduct demonstrative manoeuvres and an outstanding flexibility, which allows for the recall of armed aircraft at any time. The weapon system has the advantage of introducing asymmetry into operational scenarios, without excluding even a warning or warning strike.

Additionally, the FAS has helped raise the operational level in command, intelligence, planning and targeting across the entirety of the French armed forces. AFM

Tankers

France's current military planning policy prompted the renewal of the tanker fleet with the acquisition of 12 Phénix Multi-Role Tanker Transports (MRTTs) in February 2014.

The Phénix is a highly modified version of the Airbus A330-243 twin-engine, wide-bodied commercial airliner. It can carry up to 272 passengers with 40 tonnes of cargo and 110 tonnes of fuel.

On July 10, 2020, the Direction Générale de l'Armement (DGA, Directorate General of Armaments) received France's third Phénix MRTT. This delivery came shortly before the AAE withdrew its first C-135FR – serial 475 '93-CF' – from service on October 7, 2020, after flying more than 36,000 flight hours during its operational career.

As part of the support plan for France's aerospace industry during the COVID-19 pandemic, the French government has purchased three unconverted A330-243s in advance, two of which are second-hand, while the third will be delivered straight from the production line. These aircraft will not be immediately upgraded to MRTT standard and will be used to transport passengers and freight until they are eventually converted.



During its final flight with the AAE, C-135FR – serial 475 '93-CF' – conducted overflights of the Luxeuil, Avord, Evreux and Mont-de-Marsan ABs before being handed over to Sabena at Nîmes AAE/Alain Courtillat

Serbia Air Force and Air Defence

Out in th

At present, the Vazduhoplovstvo i Protiv Vazduhoplovna Odbrana (SAF&AD; Serbian Air Force and Air Defence) is conducting a rapid modernisation process across almost all classes of combat systems, from fighters to drones.

Since 2018, Serbia's fleet of Mikoyan-Gurevich MiG-29 (NATO reporting name: *Fulcrum*) fighters has grown from five to 14 aircraft. Additionally, its rotary-wing units have received four Mil Mi-35Ms, three Mil Mi-17V-5s and five Airbus Helicopters H145Ms. The basic structure of the air arm's aviation units consists of seven squadrons, which was joined by an eighth for unmanned aerial vehicles (UAVs) in 2020.

For air defence, the Pantsir-S1E self-propelled anti-aircraft weapon has been procured from Russia. The country has also ordered the FK-3 medium-to-long-range radar-guided surface-to-air missile (SAM) system from China.

In the near future, Serbia is expected to procure an additional H145M and it has been announced that the number of Mi-17V-5, Mi-35M and 'Made in France' helicopters will increase. The nation is also expected to obtain an undisclosed number of CASA (now Airbus) C295M twin-turboprop tactical transports to expand its airlift capabilities.

At the moment, the sources of the SAF&AD's equipment are diversified across the European Union (EU), China and Russia. However, that list is set to expand as Serbian officials have confirmed plans to procure technology from the US, Israel and Turkey (Bayraktar UAVs from the latter). For Serbian foreign policy, the signing of new contracts are a means of strengthening ties with partners. The price for political breakthroughs is strong criticism and pressure from the EU and the US for the country's procurement of equipment from the East. The Russians are also dissatisfied because Serbia is not covering all of its domestic needs with them, especially since the Chinese FK-3 on order was created – in part – by the reversible design of the Russian-made S-300PMU long-range SAM system and its associated missiles.

The task of the SAF&AD now is to accept new technology and to solve the problem of how to maintain systems of different origins and generations, because most of its aircraft, SAMs and radars are a legacy from the era of Socialist Yugoslavia. Furthermore, a great number of aircraft are without prospects and will no longer fly, but for now they remain the property of the SAF&AD because they have not been formally withdrawn from service.

For example, the SAF&AD has 80 fixed-wing combat aircraft on paper, which includes a fleet of 25 Mikoyan-Gurevich MiG-21bis/UM *Fishbed* fighters, which ceased



e cold

Aleksandar Radic provides an in-depth overview of the Serbian Air Force and Air Defence, which is currently undergoing its largest modernisation effort since the end of the Cold War

flight operations on September 25, 2020, when the last airworthy example crashed, killing both crew members. On May 21, 2021, the MiG-21's withdrawal was unofficially celebrated by the association of pilots who flew the type.

However, according to the Organization for Security and Co-operation in Europe's (OSCE's) armament registration procedure and the Subregional Arms Control Agreement (SACA), the *Fishbed* fleet remains on the SAF&AD's books.

Additionally, there are ten pre-series SOKO J-22/NJ-22 Oraos from the early 1980s, which were used for ground attack/reconnaissance missions and are now mothballed.

MiG-29 modernisation

Since the early 2000s, the SAF&AD has sought to procure one squadron of modern multi-role combat aircraft. In late 2010, an initial aircraft selection procedure was launched and a Request for Information (RFI) was sent to the world's leading aviation manufacturers in both the East and West. Just a few months later, the programme had to be suspended temporarily because the SAF&AD's infrastructure had not been adapted to accommodate new technology.

From 2012 to 2014, Serbia showed interest in procuring new MiG-29M2s or MiG-35s, but this idea was abandoned due to economic pressures.

Chinese drones

During the wave of arms procurement from various sources in June 2020, the SAF&AD received China Aerospace Science and Technology Corporation (CASC) CH-92A unmanned aerial vehicles (UAVs). In total, six aircraft and two ground control stations are located at Ladevci AB, operated by the 353rd Reconnaissance Squadron. Besides recon missions, the CH-92A can be deployed for precise strikes using FT-8C laser-guided missiles, which have a range of 6-9km.

The choice between different Chinese drones was conditional on the inclusion of technical support for the MTI-designed Pegaz (Pegasus) tactical UAV, in a bid to solve the platform's command link and ground station problems regarding flight control, image transmission and signal. The Pegaz has been flying since October 2011, but development has yet to be finalised – which is why the contract with the Chinese included MTI support for the completion of the platform, along with the CH-92As.

Medium-altitude, long-endurance (MALE) UAVs for armed reconnaissance missions were also purchased from China, but the type on order is not presently known. These drones are expected to be delivered by the end of 2021.



Two MiG-29SMs taking off. In the foreground is 18151, the only modernised aircraft of the subversion type 9.12A. The other is 18101, a prototype for the subversion 9.12B variant. On converted aircraft one of the L150 Pastel RWR antennas partially covers the serial number on the tail *All images Dimitrije Ostojic, unless otherwise stated*



The secondary role of the MiG-29 is air attack, which is why the pilots train using 80mm S-8KO rockets. With the conversion of the MiG-29 to the SM standard, the combat potential will be expanded to include smart munitions, such as the Kh-31P anti-radar missile



The SAF&AD has to settle for the four surviving MiG-29s – comprising three single-seaters (serials 18101, 18102 and 18108) and one two-seater (serial 18301) – procured by the former Yugoslav Air Force in 1997-1998. On July 7, 2009, the Serbian MiG-29 fleet was reduced to four aircraft following a fatal crash.

During overhauls in 2008 and 2011, the aircraft had undergone a limited modernisation process, bringing them up to the standard equivalent of the MiG-29SD. International Civil Aviation Organisation (ICAO)-standard navigation and communication devices were installed and some alterations to the avionics were made, including the integration of an MFI-54 multi-functional display (MFD) instead of a radar screen on the instrument panel.

Despite these upgrades, the in-service life of these aircraft was expiring, and some action had to be taken within the budget. Due to this, in 2015, Serbia approached Moscow for some second-hand MiG-29s, which were being withdrawn from Russian service at the time. The Russian Ministry of Defence (MOD) subsequently decided to donate six aircraft under a broader contract for maintenance and technical support, covering all ten of the SAF&AD's *Fulcrum* fleet.

In December 2016, following lengthy negotiations, the deal was inked, and the Russians donated three single-seat type 9.13 aircraft (serials 18201, 18202 and 18203); a pair of two-seat type 9.51 MiG-29UBs (serials 18351 and 18352) and a single type 9.12A *Fulcrum* (serial 18151). The six aircraft arrived in Serbia in October 2017.

From that point, technicians from RSK MiG started working on the so-called first and second phases of the MiG programme, which included the extension of resources for all ten *Fulcrum*s for a period of up to 40 years from the date of production. These resources would allow the Serbian MiG-29 fleet to remain operational until 2027-2029, but with the potential of an additional five years on top of that. The avionics of the donated Russian aircraft were upgraded to the same standard as the Serbian examples. Spares stocks were replenished and a number of modifications were made, including the strengthening of the fighter's vertical tails – a notorious weak point of the MiG-29, which had resulted in the Russians losing a pilot and an aircraft in 2008, leading to the withdrawal of a large number of airframes.

From July to November 2018, the SAF&AD's *Fulcrum* fleet took off again. In the meantime, a deal was agreed with Belarus regarding the donation of a further four type 9.13 MiG-29s, provided their required





Above: B-8M1 launchers for 20 80mm S-8KO/KOM folding fin aerial rockets are used in the tactical training of Serbian MiG-29 pilots
Left: One of the key changes in the MiG-29SD upgrade was the installation of an MFI-54 MFD, which can be seen on the right-hand side of the aircraft's instrument panel. Serbian pilots wear MSA LA100 helmets



Two Rolls-Royce-developed Viper Mk 633-41 turbofans power Serbia's J-22/ NJ-22 Orao fleet. However, only the three single-seat examples have an afterburner

overhaul at the 558th Aircraft Repair Plant in Baranovichi was covered under the Serbian defence budget.

The MiG-29s were delivered to Batajnica Air Base (AB) near Belgrade in two batches by Ukrainian Antonov An-124 Ruslans. The first two examples arrived on April 17, 2021, followed by the second pair on May 17. The four aircraft (serials 18204-18207) were formally inducted into service on June 9. Fortunately for the SAF&AD, the fighters arrived before the deep political crisis between the EU and Belarus began following the alleged 'hijacking' of Ryanair Flight 4978.

Serbia's 11 single-seat *Fulcrum*s will be converted to MiG-29SM standard in the third and final phase of the MiG programme. According to the 2019 contract, the fighters will certainly be fitted with R-77 (AA-12 *Adder*) active radar homing air-to-air missiles. However, they will not be the only means of BVR (beyond-visual-range) air combat, as the MiGs will also be equipped with the previously purchased R-27R1 (AA-10 *Alamo*) semi-active homing missiles, with a maximum launching distance of 75km, and new R-27ER missiles with a range of more than 100km.

For close combat, R-73 (AA-11 *Archer*) missiles will be used, which are now carried under the wings of the two aircraft tasked with the Quick Reaction Alert role. The *Fulcrum*'s radar will be modified to the N-109ME standard, which will support the firing of BVR missiles and the application of smart air-to-ground munitions.

Since October 2020, the RSK MiG team at Batajnica has been working on the modernisation of three MiG-29s, which will serve as prototypes for testing the conversion across the three sub-variants. These aircraft comprise 9.12A (18151), 9.13 (18201) and 9.12B (18101).

In May 2021, video footage from the Serbian MOD showed MiG-29SMs with underwing antennas belonging to the L150 Pastel radar warning receiver – a new addition to the aircraft.

After these changes are verified, the remaining aircraft will be upgraded, and the long process of Serbia's MiG programme will be completed later by the end of 2021 or early next year.

Orao regeneration

Serbia's dedicated fixed-wing attack platform is the Orao fleet, comprising single-seat J-22s and two-seat NJ-22s. These obsolete aircraft played an important role during the civil war, but the number of examples flying in the first half of the 2010s had been reduced to four at most, and a decision to withdraw the type from service was expected to be reached.

This situation changed in 2015, when the MOD revived Serbia's only public company for the trade of armament, Yugoimport SDPR, to modernise the two-seat NJ-22. In the early 2010s, a brochure for the NJ-22 Orao was printed, showing the platform with modern avionics and smart missiles for marketing purposes aimed at foreign customers.

Based on that plan, modernisation work began on the Orao. In 2016, one NJ-22 (serial 25507) was transformed into a static technology demonstrator, in which MFDs, various sensors and Thrustmaster's Warthog hands-on throttle-and-stick (HOTAS) joystick and throttle control panel were installed.

The initial objective with the modernisation project was to find a foreign technological partner, who would prepare a prototype with a new avionics package together with Serbian industry. The vital part of the plan was



Serbia Air Force and Air Defence



Serbian Oraos were often equipped with 57mm and 128mm aerial rockets during the civil war and in training. The 57mm BR-1-57 (HE warhead) and BR-2-57 (HEAT warhead) rockets are still used. The standard launchers are Yugoslav-made L-57-016MD and can house 16 rockets that are suspended on the J-22/NJ-22's pylons



the development of smart air-to-ground missiles by Serbia's Military Technical Institute (MTI). The first step was the remodelling of PRM-200 – a target missile from the 1970s – into the VRVZ-200 inertial/TV homing missile.

The second seat will be occupied by a pilot who will be in charge of managing smart air-to-ground missiles and bombs. Due to the large screen required in the cockpit to transfer images with missiles, the full range of the modernisation could only be integrated into the dual-seat NJ-22s, but the SAF&AD only had seven such aircraft. Initial plans to modernise 14 aircraft were set to fail as the budget would only pay for half of them.

To mitigate this problem, in 2019, the SAF&AD withdrew four NJ-22s from Belgrade's Aeronautical Museum, which have been kept in the open since 1996, when they had been withdrawn as surplus under the Sub-Regional Arms Control Agreement. The pool for modernisation now includes 11 NJ-22s and three J-22s, all of which were manufactured between 1988 and 1992.

The issue regarding the modernisation and service life extension of the SOKO G-4 Super Galeb jet trainer should be resolved through the integration of some avionics from the upgraded Oraos, increasing the fleet to nine aircraft. That number is estimated to be sufficient for the training of new pilots who are switching to the Oraos and *Fulcrums*. On paper, the SAF&AD has 19 Galebs.

Five years have passed since modernisation work on the Yugoslav-made attack aircraft began but no foreign technology partners have appeared for either jet, nor new missiles. Under the pressure of public criticism, the NJ-22 technology demonstrator (serial 25531) was unveiled earlier this year.

The aircraft had a cut nose – modelled on the UK version of the SEPECAT Jaguar – to house a thermal camera and laser rangefinder. Initial plans were officially changed and deep modernisation with a foreign partner was left for now. The issues stem from trying to convert old-fashioned aircraft with completely obsolete turbojet engines into a modern attack platform.



The 714th Anti-Armour Helicopter Squadron at Ladevci AB is equipped with the HN-42M (SA.341H) and HN-45M (SA.342L) variants of the GAMA-configured Gazelle, as well as the Mi-35M





Left: ***The armed version of the H145M is known as the H-50B in Serbian military service. Here it can be seen equipped with two L80-07 launchers for 80mm S-8KO/KOM rockets***

For the SAF&AD, one benefit of the modernisation work has been the procurement of spare and overhaulled parts for the aircraft. At the moment, the service's 241st Lovacko-Bombarderski Avijacijska Eskadrila (LBAE; Fighter-Bomber Aviation Squadron) and the Centar za Letna Ispitivanja (Flight Test Centre) are using just 12 aircraft.

*Hind*s and Gazelles

Serbia is one of the few remaining European operators of the Mil Mi-24/35 *Hind* family of attack helicopters. Ironically, half a century ago – at the time when the Soviet 'infantry combat vehicle' appeared – the Yugoslav AF&AD did not show any interest in this large and popular gunship.

Instead, the preference was for a narrowly dedicated anti-tank platform that could fight against a mass penetration of armoured and mechanised units. The solution was the GAMA project, which resulted in the production of a derivative of the Anglo-French Aérospatiale Gazelle under license in Yugoslavia, armed with Soviet 9M14M Malyutka anti-tank missiles.

In 1998, two second-hand Mil Mi-24V *Hind-E* helicopters were procured from the Ukraine for the needs of a secret aviation unit within Serbia's State Security Service, where they were used during clashes in Kosovo. In the early 2000s, the Mi-24Vs were grounded due to the expiration of their time between overhauls (TBO). The State Security Service lost interest in the aircraft and they were offered to the air force.

The two *Hind-Es* have been in SAF&AD service at Batajnica since the summer of 2006. However, offers from Russia to overhaul the aircraft were deemed too expensive and it was considered unprofitable to invest in only two airframes, which is why they have remained grounded to this day. They are officially owned by the SAF&AD, but they will almost certainly never take off again.

An unexpected move came



For now, the SAF&AD only operates a flight of four Mil Mi-35M Hind-E attack helicopters. However, it has been hinted that additional examples will be procured from Cyprus



Of the 93 Mil Mi-8 Hip tactical transport helicopters procured between 1968 and 1981, there are just two that remain operational with the SAF&AD. These aircraft still fly from Niš AB on various assignments in support of the Serbian special forces

Serbia Air Force and Air Defence



Serbia's Galeb-4 aircraft are all scheduled to be modernised in the future, allowing them to continue operating into the 2030s as a basic trainer for the SAF&AD's student pilots

Serbian aviation units

Brigade	Squadron	Platform	Location
204th Air Brigade	101st Fighter Aviation Sqn	L-18 (MiG-29) NL-18 (MiG-29UB)	Batajnica
	252nd Education-Training Aviation Sqn	N-62 (Galeb-4) N-62T (Galeb-4TM – target tug) V-53 (Utva-75) V-54 (Lasta)	
	138th Transport Aviation Sqn	T-70 (An-26) Pa-34-220T Seneca V	
		An-2TD	Niš
	890th Mixed Helicopter Sqn	HT-49 (Mi-17V-5) HO-45 (SA.342L Gazelle)	Batajnica
98th Air Brigade	241st Fighter-Bomber Aviation Sqn	J-22/NJ-22 Orao	Ladevci
	119th Mixed Helicopter Sqn	HT-40 (Mi-8) H-50S/B (H145M)	Niš
	714th Anti-Armour Helicopter Sqn	HB-47 (Mi-35M) HN-42M/HN-45M GAMA (SA.341H/SA.342L Gazelle)	Ladevci
	353rd Reconnaissance Sqn	D-80 (CH-92A)	Ladevci
Technical Test Centre/ J-5/ General Staff	Flight Test Centre	NJ-22 Orao N-62Š (unarmed Galeb-4) V-54 (Lasta) HN-45M GAMA/HO-45 Gazelle (SA.342L Gazelle)	Batajnica



Above: **A rare photograph of one of Serbia's Chinese-made CH-92A drones with an FT-8C guided air-to-ground missile attached to one of its underwing pylons. This munition weighs 18kg and boasts a range of 6.8km. It is intended for use in the destruction of valuable point targets**

when Serbia purchased four Mi-35M *Hind-Es*, which were manufactured at the Rostvertol factory in Rostov-on-Done, Russia. The attack helicopter quartet (serials 35101 to 35104) arrived in-country in December 2019 and were assigned to the 714th Protivoklopna Helikopterska Eskadrila (Anti-Armour Helicopter Squadron) at Ladevci AB in Central Serbia.

This unit also employs the GAMA anti-tank versions of the Gazelle helicopters, operating two sub-variants with internal designations: HN-42M (SA.341H) and HN-45M (attack version of SA.342L). These will not be withdrawn from service because the MTI is working on a modernised GAMA, complete with a new targeting system and domestic-made advanced anti-tank guided missiles. In total, there are now 26 GAMAs across both variants in the SAF&AD's inventory.

Modernisation – in addition to weapons – will include avionics and that part of the package can also be applied to the basic versions of Serbia's Gazelle fleet. The SAF&AD owns 16 HO-42 and HO-45 Gazelles for training and liaison purposes, as well as two HI-42 HERAs (scout versions of SA341H) that are used for reconnaissance missions.

Serbian *Hips*

The 890th Mesovita Helikopterska Eskadrila (Mixed Helicopter Squadron) at Batajnica operates five Mil Mi-17V-5 *Hip-H* tactical transport helicopters. The first two – serials 12491 and 12492 – were purchased in June 2016 in a basic configuration, without weapons and with TV3-117VM Series 2 turboshaft engines.

In October 2019, three additional helicopters arrived (12493, 12494 and 12495), equipped with VK-2500 turboshaft engines, four external hardpoints and armaments comprising B-8V-20A launchers for 20 unguided S-8KOM 80mm high-explosive anti-tank rockets and UPK-23-250 pods for GSh-23L 23mm autocannons with 250 rounds.

The second tranche has armoured fibre plating to protect the pilot and engines, along with a UV-26M self-defence system for passive jamming. This year, a local modification will be tested with the Zastava M87 12.7mm machine gun fitted on the starboard-side doors.

The 119th Mesovita Helikopterska Eskadrila at Niš Airport in southern Serbia has two Mil Mi-8 helicopters (serials 12279 and 12366), which were produced in 1980. These are the last of 93 Mi-8 rotorcraft that were procured from 1968 to 1981. Additionally, two Mi-17s with TV3-117MT engines – procured through illegal channels for the State Security Service in 1997 flew in Serbia.

In 2006, these helicopters were handed over to the SAF&AD together with the Mi-24Vs. They were repaired in 2011. One example was destroyed in an accident in March 2015, while the second – serial 12550 – was manufactured in 1989 and is recognisable by its rectangular windows. It is awaiting an overhaul.

Supporting elite forces

The 119th Mesovita Helikopterska Eskadrila operates a fleet that comprises five H145M rotorcraft, which were inducted into service





During Exercise Munjeviti Udar 21 in June, the Orao fired AGM-65B Maverick TV-homing air-to-ground missiles on targets for the first time since the end of the civil war. The munitions were procured in 1983 and used in the 1991-1995 civil war and have since remained in warehouses

in June 2019. Two examples with the internal designation H-50S (serials 14501 and 14502) are configured for combat search and rescue (CSAR) operations.

Locally known as H-50Bs, the remaining three H145Ms (serials 14503 to 14505) are equipped with Airbus's HForce 1 system for attack missions and come with a targeting sight on the pilot's helmet-mounted display (HMD).

The MTI integrated a local selection of weapons: pods with M87 machine guns and L80-07 seven-barrel launchers for S-8KO/KOM unguided rockets.

In the future, the plan is to continue perfecting the system of armaments, bringing it to the standard of Airbus's HForce 3 package through the integration of an electro-optical (EO) sensor and S-8LGR laser-guided missiles. The latter is designed in Serbia and is based on the S-8KOM and the domestic Pauk anti-tank missiles, which boast a range of 6-8km.

The procurement contract for the H145M helicopters with Airbus Helicopters was signed in December 2016 and included nine examples in total – six for the SAF&AD and three for the Serbian police. However, the order was subsequently redistributed to a ratio of 5:4. In the near future, the number of H145M helicopters will increase for both users.

There are plans for the H145M flight to work closer with the 63rd Parachute Brigade, with which it shares space at Niš.

The unit's purpose is to work reconaissance and intelligence operations behind enemy lines and a range of actions against vital facilities, as well as counterinsurgency warfare, detection and marking targets for artillery, CSAR and the infiltration of combat teams. Its structure consists of a CSAR company and four parachute companies.

Young pilot training

Training SAF&AD cadets is a long-standing issue due to the lack of interest in the recruitment of new military pilots – a trend that affects a large number of countries. This is why generations are small and only 22 new pilots have qualified in the last five years.

The first step is the application for the Military Academy competition, which is intended for candidates with a maximum age of 21. Before starting the school, students undergo medical and psychological checks, a parachute course and a screening flight course on the Utva-75 basic trainer, which is powered by a single Lycoming IO-360-B1F 134 kW (180hp) piston engine.

Candidates who are assessed as suitable become mechanical engineers and military pilots after five years of schooling. Starting this autumn, pilots will be schooled for four years. They will conduct flight training on Utva V-54 Lasta trainer, a domestic aircraft fitted with the Lycoming AEIO-580-B1A 235 kW (315hp) piston engine. Two prototypes and 15 serial production aircraft were manufactured for the SAF&AD at the Utva facility in Pancevo, Central Serbia.

The only foreign customer of the type is the Iraqi Air Force, which procured 20 examples in December 2007. The platform entered Iraqi service in 2010. Work is now underway on a 336 kW (450hp) version of the Lasta, fitted with Rolls-Royce's M250B17F turboprop engine.

Serbia's long-term ambition is to continue producing trainer aircraft in-country, which has been a tradition since the early 1920s. The industry is expected to work with MTI on aircraft modifications and weapon systems, including smart missiles. AFM

In exercises this year, the domestically developed Lasta basic training aircraft has been seen in a reconnaissance role after attacking tanks and armoured combat vehicles. Against this background, Serbia's Lasta fleet will have one pylon for 120kg inert/live bombs, 57mm unguided rocket launchers and machine gun pods



HAT IN THE RING

Leonardo has offered its AW149 multi-role helicopter as a possible candidate for the UK Ministry of Defence's New Medium Helicopter requirement, with a bid that aims to further bolster the British defence industry, long term, as **Khalem Chapman** reports

In March, the British government published its highly anticipated Integrated Review and subsequent Defence Command Paper, which outlined the planned posture of the UK armed forces through 2030 (see *'Shifting Focus: A Radical Review?'*, *AFM* June 2021, p36-45).

The latter publication cemented the Royal Air Force's (RAF) already established plan to retire its 23-strong fleet of Westland Puma HC2 medium-lift tactical transport helicopters in 2025. It was confirmed that the type would be replaced by a New Medium Helicopter (NMH), as per UK Ministry of Defence (MOD) requirements.

A product of Aérospatiale, but licence-built in the UK by Westland Helicopters, the Puma has been in operational RAF service since January 1971. The platform was inducted as the Puma HC1, with 53 helicopters delivered to the air arm in total. In August 2009, the MOD approved a GBP£300m service life extension programme, which saw 24 of the RAF's existing Puma HC1 fleet upgraded to HC2 standard. The first improved Puma was returned to service in August 2013 and from 2015 to 2021, the type was notably used to support NATO and coalition forces in Afghanistan.

The Defence Command Paper outlined that four rotorcraft fleets would be withdrawn from service, with their individual capabilities and mission sets being consolidated into one solution – negating the need for one-to-one replacement programmes. These fleets comprise the RAF's Puma HC2 and Bell Griffin HAR2 helicopters, with the latter being operated from RAF Akrotiri, Cyprus. The Army Air Corps' Brunei-based Bell 212s and Eurocopter (now Airbus Helicopters) AS365 N3 Dauphin IIs used to support UK special forces operations are also retirement targets.

While the Puma HC2 and Griffin HAR2 are operated by the RAF, it's worth noting that the funding for these platforms comes under the British Army's overall budget.

A Leonardo solution

Within a week of the release of the Defence Command Paper, Leonardo Helicopters had highlighted its plan to offer the AW149 to the UK as a suitable replacement for these four rotorcraft fleets under the NMH programme. This bid does not come as too much of a surprise, given that the company has said for many years that it would offer the AW149 to





Above: **Leonardo chief test pilot, Mark Burnard (right), and company test pilot, Lee Evans (left), demonstrate the benefits of the AW149's 'low workload' design during a media flight on June 30, 2021**
All photos, Khalem Chapman
Below: **Leonardo will offer its AW149 medium-lift multi-mission helicopter as its solution for the UK MOD's New Medium Helicopter (NMH) requirement, which seeks to replace four legacy rotorcraft fleets with a single platform**



replace some of the UK's ageing battlefield helicopters, such as the Puma.

On March 26, *AFM* and other defence media outlets spoke with Nick Whitney, the managing director of Leonardo Helicopters UK. He said the firm's AW149 bid would serve as a complete solution for the UK's NMH requirement.

He explained that – as part of the AW149 bid – the company would establish a second production line for the type at its facility in Yeovil, Somerset. If selected, the helicopters produced for the UK would be manufactured domestically, as well as any examples that are sold to future military customers on the export market. The move would provide a welcome boost for the UK's defence industry and would create more high-end jobs in the sector.

Whitney said: "We will be looking to [position] the 149 to replace the Puma – among other platforms – that would generate and sustain jobs here in Yeovil. It will also activate a UK supply chain, so it's not just us, it is all the jobs that come with the supply chain… It opens up the way for significant export opportunities."

The MOD is yet to officially define its requirements for the NMH programme, nor has it specified a timeline or clarified how many helicopters it would be seeking to acquire. However, it is known that it will be offered as a competitive contract, allowing other firms to submit their NMH solutions for consideration. Leonardo estimates that between 30 to 40 aircraft may be sought to fulfil this requirement.

Given that the Puma fleet is scheduled for retirement in 2025, it leaves just four years for a replacement to be sourced without creating a capability gap within Joint Helicopter Command. Whitney explained that Leonardo would be in a position to start production on the UK's AW149s relatively quickly, if selected.

In the case of an accelerated acquisition timeline, the initial examples could be partially manufactured at the AW149's sole production line in Italy before being transferred to the UK for completion. This would only occur if the timeline required aircraft deliveries before the second production line can be established at Leonardo's Yeovil facility.

The company already benefits from having built the AW189 commercial helicopter – which shares a common platform that originated from the AW149 – in the UK for the HM Coastguard's search and rescue (SAR) requirement. Therefore, the company would be able to re-establish the build-line in the UK with reduced lead-time and risk.

If the UK were to select the AW149, it could provide a major boost for the type on the export market in the long term – which would ultimately benefit both Leonardo and the UK defence industry, following the creation of a second production line in Yeovil. The company conservatively estimates that there will be an addressable export market for more than 550 aircraft over the next 20 years.

Whitney said: "The export activity on the back of that is the bit that's really exciting, because once we see the UK MOD taking that asset forward, they become a reference customer for the product and that's vitally important in the export market. If I look at where we've sold Wildcat or Lynx in the past – where we've sold [the] AW101 – in nearly all cases where it's to a



The company's AW149 demonstrator – registration I-RAIU – comes in to land at Leonardo's facility in Yeovil, Somerset, following a media flight on June 30, 2021

military customer, they're buying that product because it's operated by the UK MOD. They are seen as a tier-one level operator and these countries want to replicate that," he added.

Multi-mission design

Leonardo officially launched its AW149 programme in 2006, with the first prototype taking flight at the company's facility in Vergiate, Italy, on November 13, 2009. It received its official military certification in 2014 and the Royal Thai Army became the platform's launch customer in 2016, with five examples delivered. The type has since entered service with the Egyptian Navy, which ordered 24 in total.

The AW149 was initially offered as a multi-mission solution for Turkey's Utility Helicopter Programme in 2006, but the nation instead opted to acquire a number of Sikorsky S-70i Black Hawks in April 2011.

From the outset, Leonardo has boasted that the AW149 benefits greatly from its multi-mission design, high level of autonomy and situational awareness, which reduces overall pilot workload.

The company states that the platform is capable of conducting troop transport; SAR/Combat SAR (CSAR); close air support/armed escort; command and control; intelligence, surveillance and reconnaissance; medical evacuation; resupply/external load lift; and special forces operations.

When discussing the AW149 on *Key.Aero's Air Warrior* podcast on July 12 (Episode 9), Mike Morrisroe, head of UK Campaigns at Leonardo, said: "It's been designed from the outset as a multi-role platform, so it's readily reconfigurable to meet a wide range of demanding mission profiles in the most severe operational environments.

"What we sought to do with the 149 is to marry our military heritage and experience with learning from our civil fleets. From a military perspective, we've got decades of experience in providing military products to tier-one nations around the world in a number of different roles – using the MOD's taxonomy: 'Lift, Find, Attack' – and [we wanted to combine that] with our civil experience in designing helicopters with minimum maintenance burden to maximise availability," he added.

The helicopter falls under the medium-lift category of rotorcraft, having a maximum gross weight of 18,960lb. It can be powered by two different turboshaft engines: a pair of GE Aviation CT7-2E1s (as used by the Boeing AH-64E Apache Guardian) or two Safran Aneto-1Ks (developed from the RTM 322 powerplant employed by the AW101).

Each engine would come equipped with full authority digital engine control (FADEC) and dedicated auxiliary power units. The respective powerplants provide the AW149 with a maximum speed of 155kts and when fitted with auxiliary fuel tanks, the helicopter would be able to operate at ranges of up to 500nm with a five-hour endurance. Whitney told *AFM* that Leonardo would remain "agnostic" about the choice of engines used by UK AW149s, subject to its selection.

The platform requires a crew of two to operate, but it has been approved for single pilot instrument flight rules (IFR) operations. Its "low workload" design allows the aircraft to be flown by one pilot, freeing up the other to take on additional duties.

While the AW149 is smaller than the Puma, it can carry an additional 800kg of available useful fuel load, equipment or troops. It boasts a similar operational footprint to the Bell 212/412. The platform is capable of carrying 16 fully-equipped soldiers in transport missions or a maximum of six stretchers when conducting SAR/CSAR sorties.

Its smaller size in comparison with the Puma enables the AW149 to operate in both urban and confined areas with ease. During operations, its high ground clearance allows it to operate on a variety of unprepared surfaces and it is able to conduct steep approaches thanks to its high tail rotor clearance.

The platform would come with a 7.62mm machine gun – although other models/calibres can be fitted if the customer requires it. If desired, the helicopter can also be equipped with a number of external munitions through the integration of a Heavy Stores Carrier. The addition of such a capability would allow the AW149 to employ guided missiles, 70mm rocket pods and higher-calibre machine gun pods.

With the UK seeking to acquire one solution to replace four fleets of legacy helicopters, the AW149 and its multi-mission design certainly fits the bill as a contender for the MOD's NMH requirements.

However, the programme will be open to competitive tender, meaning Leonardo could face stiff competition for the contract from industry rivals, such as Airbus Helicopters, Boeing and Sikorsky/Lockheed Martin.

Leonardo was quick to throw its hat into the ring for the NMH requirement with the AW149, but Airbus followed suit soon after, declaring its intention to bid for the contract. Early reports suggest that Boeing and Sikorsky are considering their position, which is likely be officially revealed once the MOD formally issues a tender request. AFM



The Westland Puma HC2 is one of four legacy rotorcraft fleets in service with the British military that the MOD intends to replace with one solution as part of its NMH requirement. The Puma HC2 is scheduled to leave RAF service in 2025



The 'Checkmate' demonstrator seen in its pavilion prepared for a presentation to President of the Russian Federation, Vladimir Putin, shortly after the formal MAKS 2021 opening ceremony on July 20, 2021. Note the characteristic angular ventral engine air intake under the aircraft's cockpit
Press and Information Office of the President of the Russian Federation/Alexey Nikolskiy

SUKHOI'S 'Checkmate'

Russia seeks to strengthen its position in the world of fifth-generation combat aircraft following the unveiling of Sukhoi's new Light Tactical Aircraft at the 15th edition of the MAKS exhibition. **Vladimir Trendafilovski** reports on the newly revealed 'Checkmate' and its hopes for success on the export market

The official unveiling of the latest fighter design by the Sukhoi aircraft design and production company was one of the most memorable moments at this year's edition of the biennial International Aviation and Space Salon (MAKS 2021) at Zhukovsky International Airport near Moscow.

The famous Moscow-based company is now owned by the United Aircraft Corporation (UAC), itself a part of the Rostec conglomerate, a state-owned entity focused on the development, manufacture and export of high-tech products.

The design in question is a lightweight single-engine fifth-generation stealth fighter, known simply as the Legkiy Takticheskiy Samolet (LTS, Light Tactical Aircraft) and dubbed 'Checkmate'. The unveiling event was scheduled for the opening day of the exhibition (July 20) and was highly publicised by Rostec and the UAC. This included the publication of a picture of the tarped-up demonstrator a few days prior to the event while it was being rolled inside its separate pavilion, complete with the provocative text: 'Wanna see me naked?'

As the event was officially opened by the President of the Russian Federation, Vladimir Putin, he was the first to visit the pavilion housing 'Checkmate' before the public unveiling ceremony, inspecting the demonstrator in the process.

The project, which is barely a year old and is envisioned as an affordable alternative to the more complex and heavier designs currently in existence, was presented by Yuri Slyusar, the general director of UAC and Sukhoi, along with Alexey Bulatov, the deputy chief designer of the LTS.

The low radar observability design of 'Checkmate' features tailerons, two vertical stabilisers, a characteristic angular ventral engine air intake and thrust vectoring, which provides a short take-off and landing (STOL) capability. It is expected to carry a payload of up to 7,400kg at ranges of more than 3,000km, while reaching speeds of Mach 1.8 with an airframe stress limit of 8g.

Notable features inside the cockpit include: a head-up display (HUD); a single large multifunctional display (MFD); a traditional centrally positioned control stick; and the proven K-36D-5 ejection seat.

The aircraft will have a modern active electronically scanned array (AESA) radar, enabling it to engage up to six targets simultaneously under active electronic countermeasures. This radar will be part of an extensive sensor suite, which could be tailored to the specific needs of the customer thanks to its open architecture design.

Its internal weapons bays can carry up to five short- and long-range air-to-air missiles, as well as a variety of guided air-to-ground munitions. Gun packs and unguided air-to-ground rockets and bombs can be carried as well – these are intended to engage less challenging ground targets.

Static tests of the technology demonstrator



are expected to conclude by the end of 2022, with the first flight scheduled to follow in 2023. If everything goes according to plan, the first pre-series prototypes would be built between 2024 and 2025. Initial production examples could be delivered as early as 2026-2027.

It should be stressed that 'Checkmate' has been aimed at the export market from the start and the Russian Aerospace Forces are not an intended customer. As such, it was developed independently by Sukhoi to fill a global market gap for an affordable fifth-generation fighter with a price of up to US$30m per aircraft with low operating costs and a projected customer demand for 300 examples.

The Matryoshka automated logistics support system is designed to offer prospective customers full post-sale support by predicting all the maintenance operations for each individual aircraft. This aims to enable a high operational level of the aircraft fleet with on-time servicing and spare parts supply, while further lowering the operating costs.

As has been officially stated by Rostec, "a number of customers were shown the prototype and even given the opportunity to sit in its cockpit", but there was no further information released on this. However, it is clear from the promotional materials that some of the targeted countries include the United Arab Emirates (UAE), India and Vietnam – to name just a few.

The development of an unmanned combat air vehicle (UCAV) version of the type is also underway. This UCAV can be operated as part of a manned/unmanned team that comprises both manned aircraft and several autonomous vehicles. It was said that this version could be of interest to the Russian Aerospace Forces.

Last but not least, as the demonstrator had a serial number '75 Blue' painted on its sides, as well as a bogus RF-00075 code on its two vertical stabilisers, the LTS was wrongfully designated as the 'Su-75' by many sources. However, this was quickly dispelled by Bulatov, who said that the 75 is a "combination of lucky numbers", as well as "57 inverted"– in reference to the Su-57 fifth-generation multi-role stealth fighter. AFM

Below ***While the manned variant of the 'Checkmate' is aimed directly at export customers, Sukhoi is developing a UCAV version, which could be of interest to the Russian Aerospace Forces*** *Rostec*



Below ***As per current plans, initial production examples of Russia's Light Tactical Aircraft (or 'Checkmate') could be delivered to early customers by 2026 or 2027*** *UAC*





Vaarwel Orange Jumper

The Royal Netherlands Air Force is getting set to say goodbye to its one-of-a-kind F-16 test vehicle, as **Gert Kromhout** explains

The F-16 community is about to lose a valuable test vehicle. The unique Royal Netherlands Air Force (RNLAF)-operated F-16BM, serial J-066, nicknamed *Orange Jumper* will retire soon. Over the past two decades, this two-seat fighter with its orange tail emblem featuring a kangaroo has supported several test programmes for European F-16 users, the US Air Force (USAF) and manufacturer Lockheed Martin. It conducted its last big mission last April.

Orange appeal

Without doubt, J-066 is a good-looking jet, with a long red and white pitot tube, a large black and white surface on top of the right wing and a wide tail band in orange bearing the words 'AFB Volkel' after it was recently relocated from Leeuwarden. It now wears the



Almost clean configured close to the island of Texel in the north of the Netherlands. Note the orange tips on the three missile stations, which contain special test equipment
All images Frank Crébas, unless otherwise stated

flag of Brabants province, where the air base is located, emblazoned on the ventral fins. It's nicknamed *Orange Jumper* because it is packed with test equipment including jumpers and cabling that are all coloured orange.

Fokker built J-066 at its Schiphol Airport facility in 1989 and delivered it to the RNLAF as a normal F-16B squadron aircraft. Between 1998 and 1999, the aircraft was converted into a test aircraft at Woensdrecht Air Base to replace the F-16A, serial J-646.

"What makes the aircraft unique is that it has a state-of-the-art instrumentation system where you can plug in all the sensors you need," says RNLAF test pilot Maj Patrick. "Nobody has such an F-16, not even the Americans. If we want to measure something, we just add some sensors. If the Americans, like us, want to measure at a large number of points, they strip a random plane empty, fill it with sensors, do the tests and write the aircraft off. They have plenty. In the next tests they take another aircraft. We have been doing this for 23 years with 066 and all its operational systems."

According to Patrick, the US has come to Leeuwarden several times to use the *Jumper* in their programmes. One of these concerned tests of the Identification Friend-or-Foe (IFF) Mode 5, which is found in many other military aircraft types. Lockheed Martin also used *Orange Jumper* for the F-16 mid-life update (MLU) upgrades – the so-called 'M-tapes' and now the 'S-tapes' (sustainment).

Final programme

Last April, *Orange Jumper* was used for the final time in a major test programme, the Fighter Aircraft Robust Power Management (FARPM) project. The aim of FARPM is to develop a model that determines the heat management and stress on the structure of fifth-generation aircraft such as the F-35.

Royal Netherlands Aerospace Centre (Royal NLR) engineer Bart Eussen is the initiator and project leader of the programme, which started in 2012 and is now in its third phase. Together with the RNLAF, he saw the need for this research as early as 2008: "In the development towards fifth-gen and beyond aircraft there is a clear trend towards 'more electric' and a related increase in internal – electric – power. This means that power and heat management for the proper functioning of these platforms is more important than ever."

FARPM is an international collaboration involving the US Department of Defense (DoD), Royal NLR and the US Air Force Research Laboratory (AFRL) at Wright-Patterson Air Force Base (AFB) in Ohio. The RNLAF works with the Kantoor Test Vliegen (KTV, Test Flying Office) at Leeuwarden Air Base. The first phase of the programme concluded in 2017 and was intended for modelling, using the F-16 as an example. Phase Two (FARPM-2) began in 2017 and served to validate the modelling, using *Orange Jumper* and AFRL facilities.

"The current FARPM-3 is a continuation of the lessons of FARPM-2," explained Eussen. "The models we make can predict parts of the heat management in that aircraft. The objective of the project is to convert the models of the F-16 to the F-35 or other types, whereby we can make a statement about the current and future effects of power and heat management on these platforms."

Extra sensors

For this third phase, the Air Force and Royal NLR installed 52 additional sensors across the entire aircraft to measure temperatures and physical load. *Orange Jumper* made four flights in this configuration in April.

Sgt Maj Harrie, the Instrumentation specialist for the KTV, explained: "We have placed the temperature sensors on hydraulic pumps and reservoirs, heat exchangers, various systems and on the actuators of the rudder and horizontal stabilisers, in the electronics rooms and in the Environmental Control System (ECS)."

Maj Patrick provided more details about the sensors that measure the physical load: "These so-called strain gauges can measure the expansion or contraction of metal down to tenths of a millimetre. This way you can see how much force there is on a piece of metal. Those strips are on pieces of the airframe that we think are representative. We can see exactly where, when, how much, etc, something is being stretched."

Eussen added that the sensors, for example, reveal what the aircraft control system does under extreme conditions: "You get those conditions when the aircraft is heavily loaded and performs aggressive manoeuvres. We then see what the control system does, how much power is required for it and how much heat it produces. I would like to identify the hot spots on the plane because they are important for the longevity of the structure. It is not so much about the F-16, but about more modern aircraft that consist of metal and composite. If they get hot, you get a difference in coefficient expansion and possibly extra stress on your structure and effect on the lifespan."

During the four flights, Orange Jumper was equipped in various heavy configurations. Among others, it had AMRAAMs on the wingtips and AIM-9Xs under the outer wing pylons, along with two fuel tanks, the Sniper targeting pod and an ALQ-131 jamming pod. The bomb load varied. On one occasion, the F-16 flew with four GBU-39 small diameter bombs (SDBs) under the left wing and a laser-guided bomb (LGB) under the right wing. During another flight, it was equipped with four SDBs under each.



The NLR/RNLAF FARPM test team: (from left to right) Capt Marko (flight test engineer), Maj Patrick (test pilot), Maj TJ (flight test engineer), Bart Eussen (NLR), Frank van Rijn (NLR), Yuri (Orange Jumper project leader of the Defense Material Organisation), Sergeant Major Harrie (avionics specialist)

Service

Fokker delivered J-066 to 313 Squadron at Twenthe Air Base in 1989. For the next nine years, the Viper flew with 315, 312, 311 and 322 Squadrons. It received the MLU update in 1997, before arriving at Woensdrecht Air Base in August 1998 for conversion into a test aircraft.

Sgt Maj Harrie was already involved with the aircraft at that time: "We placed sensors in different places and put in a lot of electrical wiring through the entire aircraft. The wires run from the longer pitot boom to the tail and from the left wingtip to the right wingtip through all store stations under the wings and fuselage. Since an F-16 dual already has little space, this was a big challenge."

Furthermore, various control panels had to be built into the front and especially the rear cockpit: "For this, space had to be found in the front cockpit because the consoles were already occupied. By sliding a number of panels, this space was created on the left side of the cockpit."



RNLAF test pilot Maj Patrick performed the four FARPM test flights. Here, he is inspecting the main gear bay during the pre-flight walkaround



record



Above: **Flight test engineer, Capt Marko, in his office**

Below: **Nobody knows more about the test systems than Sgt Maj Harrie, an avionics specialist of the KTV since 1998**



The rear cockpit gave much less problems as not all the panels have a function there. There is an aft seat HUD monitor that was placed on the glare shield for the flight test engineer. Additionally, a three-deck tape recorder was installed in the rear cockpit to record generated data. There was also the option to exchange this with a single deck recorder if necessary.

The modified fighter was delivered in June 1999. During the modification period, the first major test project had been accepted. It concerned a forward looking infrared (FLIR) system.

Over the years, many large and smaller test projects, at home and abroad, were carried out for both software and hardware until the entire instrumentation system had to be renewed in 2014. Spare parts were hard to find for some ageing test systems.

A solid-state recorder to replace the large three-deck tape recorder was also included. In addition, a multifunctional information distribution system (MIDS) recording device was built into the rear cockpit to monitor communication with the MIDS. Harrie noted: "This again was a challenge because from the rear cockpit we had to go through a bulkhead to the MIDS on the back of the aircraft. For this, we had to get permission from Lockheed Martin to make an extra transit in the firewall behind the rear seat."

Following this update, J-066 again performed all kinds of test programmes, until a new challenge came along with the installation of an ARC-210: "This is a radio that has the option of being able to use satellite communications (SATCOM) as well. The USAF had previously issued a Time Compliance Technical Order that was only intended for the single-seat F-16. According to them, it was not possible to build this radio into a dual because of the limited space. However, after a lot of trial and error, we managed to get it done."

The last noteworthy incident was a landing mishap in November 2017. During a hard landing at Eindhoven Air Base after an operational training flight, the landing gear broke off, following which *Orange Jumper* spent almost a year in the shed for repairs.

"What makes the aircraft unique is that it has a state-of-the-art instrumentation system where you can plug in all the sensors you need"
Maj Patrick, test pilot



Maj Ralph, the KTV's current chief test pilot, in front of a Dutch F-16AM of the Arizona Air National Guard's 162nd Fighter Wing



Above: **F-16BM, serial J-066, with a full load over the Waddenzee, located north of its then home base at Leeuwarden**
Below: **'Orange Jumper' in one of the heavy configurations. It carries four small diameter bombs under each wing, as well as two fuel tanks, two AIM-120s, two captive AIM-9 Sidewinders, two AMRAAMs on the wingtips, an ALQ-131 ECM pod under the centerline and a Sniper targeting pod on the engine intake**

Analysing

The data recorder in the device records everything neatly and NLR has started analysing the data. Being in the back-seat, flight test engineer (FTE) Capt Marko noticed interesting things during these flights.

The FTE can view the measurement data immediately on his special displays: “For example, we saw how the cooling works on the temperature and pressure of the fuel and hydraulic systems. We had concerns over the cooling at low speeds where the control system works hard and you have little fuel, for example when landing. Fuel is used in the F-16 for oil cooling. We saw that the temperature of the oil was higher than when we fly with more fuel. We were able to take a good look at the effectiveness of the heat exchanger.”

The models also provide insights into the operational deployment of the aircraft under certain conditions. Eussen said: “So, for example a pilot does not have to switch off a system such as the radar as a result of rising temperatures at a time when he needs it, or that a system switches itself off because it gets too hot.”

Within the FARPM programme, the AFRL mainly provides data analysis, the development of models for electrical components and systems, and system integration validation tests. In addition to a US-operated F-16B, the AFRL also uses a Dutch F-16A, serial J-230, at Wright-Patterson AFB, both of which are no longer airworthy.

Royal NLR focuses on flight test data and modelling, simulation and verification of aircraft and system behaviour. Eussen said: “If we in the Netherlands want to sit





Pulling Gs! Note Orange Jumper's special test underwing tanks and the large 'viagra' pitot tube

"If we want to measure something, we just add some sensors. If the Americans, like us, want to measure at a large number of points, they strip a random plane empty, fill it with sensors, do the tests and write the aircraft off" *Maj Patrick, test pilot*



at the table with Lockheed Martin, not just as a listener but also as a knowledge party, you must also be able to contribute knowledge. How do we fly the aircraft and what are the consequences of the way in which the [RNLAF] use the aircraft now and intends to use it in the future? For that you have to get deeper into the plane together with other operators – in this case, the USAF."

Valve issues

Spin-offs from the programme are proving very valuable in support of F-16 operations and maintenance. For example, Lockheed Martin included restrictions in the F-16 MLU flight manual until 2017, which in certain cases meant there were restrictions on the configurations of certain wing pylons on the aircraft. This concerned incidences in which the F-16 carries a certain type of bombs under both wings. However, during the second phase of FARPM in 2017, J-066 demonstrated that the limitations for the tested conditions could be lifted. Lockheed Martin included this in the manual.

The KTV took the opportunity to test a new engine valve during these FARPM tests. Air comes out of that valve for, among other things, the ECS system. "It wears out much faster than we ever imagined," explained Patrick.

"Ten years ago, we bought a large number of those valves, but a couple of years back they had all run out – and not only with us, but with everyone that flies F-16s with this engine type. New ones were no longer available. We started looking for replacements and even asked the 'boneyard' in Arizona if they had this type of valve. They hadn't. Together with NLR, the air force then investigated why they broke down so quickly and whether overhaul was possible. The latter succeeded, but that was not sufficient. We even had to borrow broken valves from the Norwegians to be able to overhaul them. The problem was very urgent. If no solution had been found, we would no longer be flying F-16s.

"The USAF has now found a company that can make new ones. The KTV has been asked to test the new valve. Because J-066 is full of sensors, it was able to pinpoint what the valve was actually doing [to break]."

Nearing the end

The end of operational life for *Orange Jumper* is fast approaching. The next 300-hour phase inspection is approaching. According to Patrick, the RNLAF will no longer carry out that inspection despite this F-16 having logged only 3,400 flying hours: "We want to use her for as long as possible, so we use the remaining flying hours as economically as possible. I think if we can fly with her until the end of the year, maybe early next year."

Despite the retirement of the Dutch F-16s in 2024 there is still a need for test aircraft. So, the RNLAF has equipped two single-seaters, serials J-055 and J-060, with recording equipment that examines data in the aircraft. That does not mean the two F-16AMs are dedicated test aircraft.

Patrick stated that the single-seaters were chosen because the air force will no longer fly with duals in the final years of the F-16: "That



has an operational reason. The singles can carry more fuel and therefore have a longer endurance."

These two aircraft remain at Volkel Air Base. Ralph continued: "They are mainly used in the daily training programme of 312 Squadron, the last operational F-16 squadron as the other squadron (322 Squadron) is currently transitioning to the F-35 and stopped flying the 'Viper' in July 2021. As a test flight organisation, this means we have less influence on when they are available for testing and when they undergo major maintenance. But with two aircraft, there is a greater chance that one will be available for testing."

The KTV will mainly use the two F-16AMs for the multi-role fighter's software updates.

What will happen to *Orange Jumper* once it has been withdrawn from service has yet to be determined. In Europe, only the Belgians, Danish, Norwegians and Portuguese still fly the F-16AM/BM and, according to Patrick, they are in line to take over some examples of the RNLAF's outgoing 'Viper' fleet. However, there is one problem with J-066: "It is a Dutch device that is full of Dutch measuring equipment. Suppose we were to sell it with all that special equipment, then it would require support from the RNLAF and NLR for a long time to come, because the buyer would continue to ask questions. The air force is therefore not interested in keeping this aircraft in the air, because we will stop flying the F-16 completely."

While the RNLAF does not want to continue supporting J-066, Eussen says that Royal NLR is open to any orders for *Orange Jumper* if another air force is permitted to buy it. However, converting it back to a standard F-16BM would be tricky, as Patrick said that stripping all of the test equipment and cabling would require a lot of effort: "Altogether, it contains 25km of orange cabling! The first system we built in 1998 weighed 450lb. I think we are now at 550lb. Wherever there was some space, things were built in that are applicable to the measuring system."

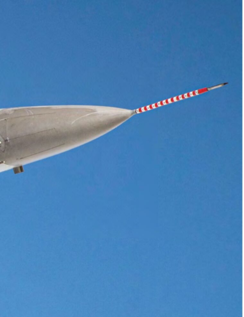
Essentially, while Royal NLR is open to selling the aircraft, the work needed to return it to a regular configuration means that it would be unlikely to be sold.



J-066 during a high-speed run over the Vliehors range, carrying two inert Mk84 bombs *Gert Kromhout*

Future of KTV

With the retirement of the J-066, the organisation will also change. Currently, KTV is part of 322 Squadron, but it started transitioning to the F-35A in July 2021. Being part of a unit with only one F-16 is not desirable. Ralf said: "So we are going to be included in the Air Combat Development Center (ACDC) at Leeuwarden and support the F-16 and F-35 flight tests from there. Recently, 312 Squadron has added a newly trained test pilot in its ranks. He can co-ordinate the flight tests at Volkel and conduct them together with us. Gradually, our focus will shift more to the





Above: ***J-066 fitted with the old Litening AT targeting pod***

Right above: ***In formation with the second F-35A, heading towards an RNLAF KDC-10 tanker that is just visible above the nose of the F-35A. In May 2016, F-35A, serial F-002, visited temporarily from Edwards AFB, together with F-001***

Below: ***The RNLAF and Royal NLR installed 52 sensors over the entire aircraft to measure temperature or physical load***

F-35. However, there will not be an F-35 in the Netherlands like the J-066. In the US there is an F-35 with special instrumentation, and it can be used where necessary."

The testing capabilities of *Orange Jumper* will certainly be missed. In collaboration with Royal NLR, the air force is investigating whether a test system can be developed that they could mount on any aircraft. After all these years of experience it would be a shame not to continue the work that has proved invaluable for the RNLAF, Lockheed Martin and other air force operators. AFM

"We want to use her for as long as we can, so we use the remaining flying hours as economically as possible. I think we can fly with her until the end of the year, maybe early next year" *Maj Patrick, test pilot*





On faraway seas

Alan Warnes caught up with HMS *Queen Elizabeth's* Carrier Air Wing Commander, Capt James 'Blackers' Blackmore, to uncover more about the carrier's deployment



No 617 Sqn 'Dambusters' qualified two more pilots on August 14, while in the Philippine Sea. It was a big moment for them, as they conducted their first landing and take-off from HMS Queen Elizabeth

By early August, HMS *Queen Elizabeth* (R08) and her Carrier Strike Group (CSG21) had made safe passage to the Philippine Sea. By then, the journey (with 32 aircraft) had taken more than ten weeks and entered phase three of the deployment.

During a telephone conversation with Capt Blackmore, right on cue, came the roar of jet engines on deck. He laughed: "You caught us at the right time, we have just started carrier night-flying operations and there are eight F-35Bs taxiing across the deck for a launch."

You could just imagine the wind blowing across the decks, as they taxied out to depart in the darkness. Capt Blackmore, enthused about the UK's latest carrier, some 11 years after the HMS *Ark Royal* (R07) was abruptly retired, said: "We are 700 miles from land in any direction – this is true blue-water ops. We have been doing this kind of flying since we entered the Med, all the way through to the Indian Ocean and South China Sea and Philippine Sea, as we head towards Guam."

Passing through the Suez Canal in late July, in what 'Blackers' referred to as Phase 2,



HMS Queen Elizabeth (centre) and USS America (forward), with six F-35Bs on its deck, are joined by the Japan Maritime Self-Defense Force's JS Ise (DDH-182) – a Hyuga-class helicopter destroyer. They were part of a large-scale formation sailing exercise in the Philippine Sea on August 24
All images MOD Crown Copyright, unless otherwise stated

heralded the next stage of CSG21. "Heading east of Suez, through the Red Sea, across the Indian Ocean and towards the western Pacific really focused people's minds. Now, we are in the South China Sea/Philippine Sea for Phase 3.

"We are transiting through international waters and air space, conducting our routine flying operations, while training, when required to. However, it's part of the world we haven't been to for many years, and not an area we really understand. We will work with nations that surround the South China Sea and this part of the Pacific. It's been hugely professionally rewarding to operate a fifth-gen carrier this far away from the UK."

Operation Shader

Capt Blackmore spoke about his pride at being CAG (Carrier Air Wing Commander) on the HMS *Queen Elizabeth*'s first operational deployment. He admitted the highlight was getting it all together: "Bringing it to the starting line and departing Portsmouth as an air wing, across all the units and ships. But I would be lying if I didn't say the real highlight was reaching the eastern Med and delivering that sustained period of Operation Shader ops [the UK's contribution to fighting Islamic State in Iraq and Syria] from the carrier in June. That, for me, was a professional highlight, as it really showed the return of carrier strike for the Royal Navy and our ability to deliver and demonstrate a credible carrier strike capability.

"It was a brilliant few weeks, completing 16 hours of flying every day and contributing over 50% of the combat air mass to the CAOC [Combined Air Ops Centre] in theatre. There was a lot riding on it and people were watching to see how the aircraft and the carrier would hold up. It all went magnificently. The jets didn't drop any weapons, as there was no requirement during our period there, but what we did do was contribute significantly to the [aerial] picture over Iraq and Syria, and we were in constant comms with those on the ground."

After its port visit to Augusta, Sicily, to replenish stocks during June 11-15, the carrier joined Op Shader until it docked at Limassol, Cyprus, on June 30. The F-35Bs of the Royal Air Force's (RAF) No 617 Squadron 'Dambusters' and the US Marine Corps' (USMC) Marine Fighter Attack Squadron 211 (VMFA-211) 'Wake Island Avengers' swung into action. "These fifth-gen fighters provided

"We are 700 miles from land in any direction – this is true blue-water ops. We have been doing this kind of flying since we entered the Med, all the way through to the Indian Ocean and South China Sea and Philippine Sea, as we head towards Guam"

Capt James 'Blackers' Blackmore, HMS Queen Elizabeth's *CAG*

The CAG

Capt Blackmore commands all the squadrons and flights across the entire wing on behalf of all the ships in CSG21 and delivers the strike output from the F-35Bs as well as supervises the helicopter flying.

He's been working with the carrier for four years now, previously as Wings (known in the US as Air Boss) looking after the carrier's flying ops. "It was a nice step up from Wings when I participated in all the carrier trials. So, I did the first helicopter trials, then jet trials on WESTLANT 18 through WESTLANT 19, and then the whole force generation programme, as well as all the exercises we have done through to this point."



Capt James Blackmore, the HMS Queen Elizabeth's CAG. He was the last Harrier pilot to fly from an aircraft carrier, HMS Ark Royal, in November 2010



"We will work with nations that surround the South China Sea and this part of the Pacific. It's been hugely professionally rewarding to operate a fifth-gen carrier this far away from the UK"

Capt James 'Blackers' Blackmore, HMS Queen Elizabeth's *CAG*

overhead and fairly persistent support, using their onboard systems, whether it was their electro-optical targeting, radar or other sensors. While it would have been great to drop weapons, and the aircraft definitely flew with weapons during every sortie, there just wasn't a requirement during that period. Regardless, we certainly contributed in a plethora of other non-kinetic ways."

While in the eastern Med in late June, the CSG21 task force knew the Russian military was operating out of Syria for its own anti-shipping exercise (see *AFM*, August 2021, p6-7). When asked if they encountered the Russians during the drills, the CAG replied: "It's well known the Russian navy and air force was there – its international seaways and, inevitably, we looked at them, as they looked at us. We have a capability they don't have – a fifth-gen carrier with fifth-gen aircraft onboard, so, understandably, there was a lot more interest in what we were doing."

Flying day and night

Obviously, the air programme has been full on. The aim is to fly six out of seven days or nights – the day off providing people with a chance to rest. In the eastern Med, the carrier's air wing flew every day from one port visit to the next with continuous air activity from the deck. "Since leaving Portsmouth [on May 1] until now [early August] we had flown 2,700 hours across the air wing – 1,500 hours of fixed-wing and 1,200 hours of rotary wing. That included 1,100 vertical landings on the carrier, and illustrates the tempo we have been undertaking since leaving."



HMS Defender's Wildcat HMA2 conducts a sortie equipped with its Martlet wings over the Philippine Sea on August 21

On the integration between the USMC and British F-35Bs, Capt Blackmore stressed: "Integration is absolutely seamless. We have spent a year and half working together – they have been over before, a couple of times, on Groupex and Strike Warrior. The only difference is the voice on the radio. The way we train, the way we fly, and the tactics are exactly the same. The launch just now had four -211 and four 617 Sqn jets doing integrated training and integrated ops – we work together as one."

During the deployment, all the assets have been working, but the primary aim of the only fifth-generation aircraft carrier in the world right now, was for its fifth-gen F-35Bs to deliver strike. They don't do that on their own, they need support from other assets. "We saw our four 820 Naval Air Squadron [NAS] Merlin HM2s, specialising in anti-submarine warfare [ASW], looking for what could be out there and delivering us the recognised



HMS Kent, her embarked flight and Royal Marine Commandos conducted a live firing gunnery exercise from the air while on maritime patrols in the Philippine Sea



A 'Dambusters' F-35B goes off the ramp with its engine nozzle inverted, while a VMFA-211 jet waits

maritime air picture [RMAP] a decent distance from the carrier. The RMAP was overlaid with the information of local ships or aircraft by the ASaC [airborne surveillance and control] Merlin with its Crowsnest capability.

"There are also four 815 NAS Wildcat HMA2s on the two frigates and destroyers, contributing to the surface picture. We are using the 820 NAS Merlin HC4s we have on RFA [Royal Fleet Auxiliary] *Fort Victoria* [A387], originally on the HMS *Queen Elizabeth*, for the re-supply from shore-side, search and rescue and combat recovery capability."

The Wildcats are also equipped with both the Thales Martlet anti-surface missiles and MBDA Sea Venom/ANL anti-ship missile. The latter is ideal for use in cluttered and complex maritime environments. According to MBDA, the Sea Venom will defeat a broad spectrum of targets, including small, fast-moving craft through to larger ships – at sea or in port – as well as coastal land targets.

Unlike the previous Sea Skua missile, the Wildcat with its Seaspray 7400 radar will not remain exposed by maintaining its position to guide the missile. The Martlet lightweight multirole missile is for use against asymmetric targets, such as suicide boats or unmanned surface vehicles – the kind of threats CSG21 could have encountered while passing through the Persian Gulf or off the Gulf of Aden, Yemen. Swarming by unmanned boats or air systems with low radar signature pose a real threat, and the Royal Navy's solution is to use the Wildcat's MX-15Di EO/IR laser turret to guide the Martlet.

Capt Blackmore gave further details of the other vessels in CSG21 and the flying assets. "The Wildcats are based on two Type 45 destroyers HMS *Defender* [D36] and HMS *Diamond* [D34] and two Type 23 frigates, HMS *Kent* [F78] and HMS *Richmond* [F239]. The RFA *Fort Victoria* ammunition ship houses three Merlin HC4s, and while the RFA

Sentry's ultimate ops

An RAF-operated Boeing E-3D Sentry AEW1 deployed to RAF Akrotiri, Cyprus, and supported HMS *Queen Elizabeth* and her strike group as it sailed through the eastern Mediterranean and Suez Canal.

The aircraft, bristling with sensors, would check the airspace for any potential threats. When available, the aircraft also integrated into the CSG21 network. That was, of course, before the type was withdrawn from operational use on August 4. Capt Blackmore added: "It was a natural thing to do – have them watching over us – and I see it as a huge positive that other wide-bodied assets – that may [or may] not be in theatre, whether UK, NATO or US – can dock in to what we are doing.

"It's another tool in our armoury. We don't always need it but when it's there, it's helpful. It extends our radar horizon, flying a lot higher than our helicopters, to provide a wider coverage, and [it] stays on task a lot longer.

"While crossing the Red Sea, passing south of Aden [an area known for piracy] or transiting into the South China Sea into the Pacific, our US, NATO or Australian allies can provide great support. Whenever we dock in with one of our close allies and integrate, we contribute a lot to them just as they do to us. We are right in the environment, sharing what we are witnessing. It's a two-way thing."



An RAF E-3D Sentry AEW1 was used for high-level airborne surveillance for the HMS Queen Elizabeth as the carrier moved through the Suez Canal, Persian Gulf and the Straits of Hormuz *MOD Crown Copyright/Sgt Nik Howe*

Sims at sea

It might surprise some to learn that HMS *Queen Elizabeth* houses four simulators on board, as well as deployed mission rehearsal trainers. The four F-35 simulators carry out high-end training and currency requirements – or, as the name suggests, missions rehearsal. "We are the only carrier in the world with a simulator embarked – these are really encouraging times. If [personnel] can't fly the real aircraft, which isn't very often, we put them in [the simulator]."

Two sea containers each house a pair of simulator cockpits that follow the design of the aircraft with helmet and sensors in each one. They have sea motion, too, but that isn't really needed here! If a pilot hasn't flown for a while, they can regain their night, instrument flying or tactical training currency.

"The latter is important for me as the CAG", Blackmore said, "because [we] can keep up with the currency training and, if the weather stops us flying, which hasn't happened very often, we can get in [a simulator], or if we are alongside at port, we can maintain the currencies."

Tidespring [A136] doesn't have anything based on it, the hangar is routinely used, as is the landing pad. USS *The Sullivans's* [DDG-68] flight deck often has a Wildcat on it, as does the [Royal Netherlands Navy's] HMNLS *Evertsen* [F805]."

All the types of aircraft are on alert for certain roles, but they don't always need to be armed, Capt Blackmore stressed: "A lot depends on what we are doing and where we are. I will have Merlin HM2s on alert for anti-submarine warfare or Wildcat HMA2s contributing to the surface warfare (ASuW) commander; while F-35Bs are on alert for anything that they might be needed to do."

The three Crowsnest Merlins are Link 16 capable, which is useful for either communications or docking into the Link 16 network. This means it can work with both the F-35B and surface ships, by connecting via the link architecture that connects all these force elements. "Full Operational Capability (FOC) of Crowsnest is not until later next year, so, in essence, we are developing the capability throughout deployment, while it works with us. Every





Above: An F-35B assigned to the 'Dambusters' prepares for a vertical landing aboard HMS Queen Elizabeth, while another taxies to its parking spot
Above right: A Wildcat HMA2 from No 206 Flight (815 NAS) hovers over the flight deck of HMS Kent during a winching exercise on August 20. The drills are practised regularly to ensure crews remain at the highest level operationally
Below: A VMFA-211 F-35B gets ready to depart the carrier. The unit's jets were involved in cross-deck training with the USS America amphibious assault ship







time we have flying operations, we put a Crowsnest up, too. Its good and is really encouraging to see this new capability grow.

"The three Merlin HC4s of 845 NAS 'B' Flt are used for MITLE [maritime inter-theatre lift] for movement of passengers, mail and cargo around the task force or with a shore base, if we are close enough. The second is SAR [search and rescue], and in that they are on alert/standby for combat recovery. That's pretty unique, which [enables] us to use them with the commandos that are with us."

Of the 14 helicopters, there is always one available for SAR. But more often than not, when there are aircraft flying, there is a helicopter flying out there anyway, available if required. That could be to assist mariners or CSG21, but there has been no need so far.

Linking up

Over the next two and a half months in this region, CSG21 will integrate operationally with the militaries of partner nations, to understand them and work with them in a very challenging environment. China could pose a few problems and issues, as the CSG21 (with its allies) tests Beijing's resilience by moving into the 12-mile exclusion zones around the disputed Spratly Islands and Paracel Islands, etc.

'Blackers' explained: "It's a region [that] the Royal Navy doesn't usually operate in, but the chance to come and spend time here, test our equipment and our people, is where the highlight lies."

Not surprisingly, the action hasn't dropped off in recent weeks either. On August 21, F-35Bs from VMFA-211 cross-decked with the US Navy amphibious assault ship, the USS *America* (LHA-6); when they landed, refuelled, then 'bombed up' before flying a mission and returning to the HMS *Queen Elizabeth*. Five days later, CSG21 was involved in Exercise Noble Union, working with Japanese and US vessels to test naval concepts and develop techniques and procedures.

Integration is the buzz word these days, and now the UK has a big, new, exciting aircraft carrier force that brings strategic reach as well as the chance to renew diplomatic and military ties with allies all over the world. AFM

Strike Warrior final checks

On leaving Portsmouth on May 2, CSG21 headed towards the northwest of Scotland for Exercise Strike Warrior. "We trained right across the board for it, in what was part of Joint Warrior. That was our opportunity to do our final checks, showing we were fit and ready to get on our way to defend ourselves and also deliver a carrier strike capability in a carrier strike group," Blackmore explained.

"No ASRAAM [advanced short-range, air-to-air missile] had ever been fired in the UK from an F-35 before we did it, let alone at sea [for Strike Warrior]. So, as well as dropping dual-mode 500lb Paveway IVs, the US dropped [500lb] GBU-12s [laser-guided bomb] and GBU-32 [Joint Direct Air Munitions, JDAMs]. It gave us a chance to test our weapons systems for whatever opposing forces throw our way – to fully end-to-end test the mag, from magazine, through weapon prep, onto flight deck on aircraft and on to the target."

Strike Eagle shoots down Iranian drone

When an Iranian drone approached US special forces operating in Syria in late August, a Boeing F-15E Strike Eagle assigned to the 48th Fighter Wing was scrambled to shoot it down. **Babak Taghvaee** delves into the shootdown and the Iranian drone problem

Countering UAVs

Following the increase in threats towards USSOF troops in Syria from loitering drones operated by IRGC proxies, the USAF's 332nd AEW held a Counter-UAS (C-UAS) exercise at Muwafagh Al-Salti AB in Jordan on July 27, 2021. During the exercise, two 494th FS F-15E pilots and two weapon system officers (WSOs) participated.

The exercise scenario focused on scrambling two F-15Es from Jordan to counter a drone threat in the Al-Tanf region in just 20 minutes. Both were armed with a pair of AIM-120C AMRAAMs, an AIM-9M Sidewinder and an AIM-9X Captive Air Training Missile (CATM) to use against the drone(s) threatening US forces in Syria. The F-15E pilots could have first engaged the UAVs from long distance using the AIM-120C, before 'attacking' them at a closer range with the AIM-9X CATM, with the assistance of the Lockheed Martin Sniper advanced targeting pod operated by the WSO. In the latter stage, the pilot could use the AIM-9M to counter the final threat.

On August 21, 2021, an unknown unmanned aerial vehicle (UAV) approached the US Army Mission Support Site Green Village in Deir Ez-Zor, eastern Syria. According to Pentagon sources, the drone was Iranian. This incursion led to a pair of US Air Force (USAF)-operated F-15E Strike Eagles from the 48th Fighter Wing (FW) at RAF Lakenheath, Suffolk, being scrambled to the area, where the UAV was shot down.

Since 2017, Iranian drones – operated by the Islamic Revolutionary Guard Corps (IRGC) and its proxies in Syria – have posed a threat to coalition forces involved in the anti-Daesh mission known as Operation Inherent Resolve. In at least three cases, these UAVs have been shot down. So, what are the drones being operated by the IRGC in Syria and how is the USAF dealing with them?

Shahed-129s in Syria

In March 2014, the IRGC Aerospace Force (IRGCASF) airfreighted two Shahed-129 unmanned combat air vehicles (UCAVs) to Syria inside one of their Ilyushin Il-76TDs from Qadr Air Base (AB) – a part of Tehran's Mehrabad International Airport. The drone control stations were later delivered to Damascus International Airport, Syria, from Qadr. They were subsequently transferred to the Mezzeh Military Airport in Damascus, where they were assembled.

The first known mission of these drones occurred on April 11, 2014, when one flew over Eastern Ghouta to gather intelligence for the IRGC Quds Forces (IRGCQF) and their proxies, fighting against the Ansar Al-Sharia extremist group. Despite being a UCAV, the Shahed-129s were mainly used for surveillance missions during those early months in Syria.

The Shahed-129 was not the first Iranian drone type to be shot down while conducting intelligence-gathering missions in Syria. Even before the UCAVs were deployed, the IRGC had operated Sadegh (upgraded Mohajer-4) and Shahed-123 surveillance drones in Syria since 2013.

Lessons learned from those operations helped the IRGCASF's Shahed Aerospace Industries to improve the Shahed-129.

Shahed Aerospaces Industries – located at the IRGCASF's Badr AB – launched the Shahed-129 project between 2009 and 2011. Equipped with an Austrian Rotax 914 piston engine, the first prototype took flight in 2011 and went on to take part in the Great Prophet-7 military drills on July 3, 2012, to film the launch of several IRGCASF ballistic missiles.

It was not until October 2012 that the drone was officially unveiled by the IRGCASF. A contract was eventually finalised with the Iranian Aircraft Manufacturing Industries (IAMI) to mass produce them.

2017 shootdowns

Between 2013 and 2015, IAMI had produced just eight Shahed-129s for the IRGCASF, which planned to arm them with Fat'h-362





Pilots and WSOs of the 332nd AEW's 494th EFS learn how to bed down their Strike Eagles at an undisclosed location in Southwest Asia on April 5, 2021. This training is useful for aircrews when they land at barebases and lack access to the standard maintenance support staff *USAF/Tech Sgt Paul Duquette*

(also known as Sadid 361) precision-guided missiles. This never materialised due to the lack of necessary technologies required to produce the small rocket motors.

As a replacement air-to-surface missile, Sadid-341 (foldable wings) and Sadid-345 (fixed-wing) smart bombs were designed and produced for the Shahed-129s. They used the television (TV) and infrared (IR) seekers of the failed Fat'h-362 missiles. The new smart bombs were successfully tested in Syria in 2014 and videos of their first successful tests were released in 2018.

Changes in 2017 saw the IRGCQF begin using Shahed-129s to spy on coalition forces, especially US Special Operations Forces (USSOF) at their camp near the Al-Tanf border crossing in eastern Syria. This led to the downing of two IRGCASF Shahed-129s by a USAF-operated F-15E of the 492nd Fighter Squadron (FS) 'Madhatters', which had deployed to Muwafaq al-Salti AB in Jordan during June 2017.

The first one was shot down on June 8, 2017, after it attempted to carry out an airstrike against coalition forces involved with Operation Inherent Resolve near Al-Tanf.

The drone dropped a Sadid bomb next to the coalition troops, but it failed to detonate. As the UCAV circled to drop another bomb, two 492nd FS F-15Es conducting a Combat Air Patrol shot it down – probably with an AIM-120C AMRAAM. A second Shahed-129 was destroyed on June 20, 2017.

On April 9, 2018, F-15Es bombed an aircraft hangar used by the IRGCQF at T4/Tiyas AB in Homs, Syria, destroying all military equipment inside, including the three remaining Shahed-129s in the country. The IRGCQF subsequently replaced its Syria-based Shahed-129s with Mohajer-6 UCAVs.

Satellite spots Mohajer-6s

A satellite image taken of Hams AB on October 19, 2019, showed the presence of Mohajer-6s, which were used to monitor the militias of the Turkish Islamic Party.

The drone had racks of Qaem smart bombs – an enhanced and improved variant of the Sadid family of munitions.

While the IRGCQF started using UCAVs in Syria, they were never operated close to the areas where US military forces had been present to prevent them being shot down by the USAF in the same way the Shahed-129s were. However, this changed on June 26, 2021, when the IRGC-backed militias used 155mm unguided rockets to target the US Army Mission Support Site Green Village. It wasn't long until the IRGC started to fly drones close to the area again to test the US military's reaction.

Finally, on August 21, 2021, a surveillance drone, which according to unnamed Pentagon sources was Iranian made, approached the Green Village compound and was hit by what is believed to be an AIM-9M Sidewinder air-to-air missile, fired by another F-15E.

According to local sources, the drone was believed to have been an IRGCQF-operated Mohajer-6, which was one of six used by the Hashd Al-Shaabi (Popular Mobilization Forces) for intelligence-gathering and air interdiction operations.

Rumours soon spread across social media that Brig Gen Christopher S Sage, commander of the USAF's 322nd Air Expeditionary Wing, based at Al Udeid AB, Qatar, was the pilot of the F-15E that shot the drone down with an AIM-9X. However, the F-15Es deployed to the Central Command (CENTCOM) area of responsibility were from either the 492nd or 494th FS 'Panthers', which still use the AIM-9M together with AIM-120C missiles during combat missions (see panel). The 48th FW Strike Eagles do not employ the AIM-9X operationally, just the Captive Air Training Missile (CATM) variant for training purposes.

Lt Col John W Ross, a spokesman from US Central Air Forces, told *AFM*: "For security reasons, I cannot discuss aircraft type, munitions used, or the name of the pilot who carried out the mission."

CENTCOM would not comment on the drone's origin, but unnamed Pentagon officials have told the mainstream US media that it was Iranian. Other evidence points to it being a Mohajer-6, but it is not clear if it was armed when it was shot down. It is also unclear whether it was operated by the IRGCQF or by Hashd Al-Shaabi proxies from inside Iraq. It was the third downing of an Iranian drone by the 48th FW. AFM







Right above: ***This Mohajer-6, c/n P077A-020, was delivered to IRGCASF in 2019, but ended-up in the hands of Hashd Al-Shaabi in 2021 and was often flown over Al-Qaem during border patrol missions. It could have been the drone shot down by the USAF on August 21, 2021*** *Kevvan Tavakkoli*

Right: ***The first two Shahed-129 prototypes were produced by IRGCASF's Shahed Aerospace Industries hangar with the help of IAMI company. They can be seen here during an exhibition*** *Ali Naderi*

Left: ***A USAF-operated F-15E - serial 91-0308 - from the 494th Expeditionary Air Squadron (EFS), a part of the 332nd AEW, departs Al Dhafra AB in the UAE to support regional security operations on April 30, 2021*** *USAF/Staff Sgt Zade Vadnais*

Disintegrated in days

Babak Taghvaee considers the fate of the Afghan Air Force following the Taliban's takeover of Afghanistan



At approximately 1600hrs (local time) on August 15, 2021, a group of Afghan government officials – led by the former President Ashraf Ghani – boarded several Cessna 208Bs of the Afghan Air Force's (AAF's) Kabul Air Wing and fled to Tajikistan. Their departure came just a few hours before the fall of Afghanistan's capital city, Kabul, to the Taliban's extremist militias. Soon after, tens of AAF-operated helicopters and fixed-wing aircraft were on their way to Tajikistan and Uzbekistan to prevent them falling into the hands of the Taliban. Despite those efforts, the Taliban managed to capture more than a hundred AAF aircraft, although barely 40 were operational.

Declining combat readiness

According to a report by the US Special Inspector General for Afghanistan Reconstruction, the AAF had 211 aircraft – with 167 based in the country – as of June 30, 2021.

They comprised 23 A-29B Super Tucanos; ten AC-208B Eliminators; 23 Cessna 208B Grand Caravans; three C-130H Hercules; 32 Mi-8/17 *Hips*; 43 MD530F Cayuse Warriors and 33 UH-60A+ Black Hawks. Another 35 AAF platforms were overseas undergoing maintenance and overhaul or had not been delivered, such as a C-130H and 24 Mi-8/17s. Furthermore, seven MD530Fs and 12 Black Hawks had yet to be delivered.

The list of AAF aircraft published by the Special Inspector General lacked any information on the 18 Pilatus PC-12/47E signals intelligence (SIGINT) aircraft in service with the Special Mission Wing of Kabul. Only 61% of them are believed to have been operational when the Taliban reached the gates of Kabul on August 15.

The decline in combat readiness of the AAF started in 2014 after the US government banned the country from sending its large fleet of Russian helicopters back to Russia for overhaul. This included Mi-8MTV-1 and Mi-17V-5 transport helicopters, as well as Mi-24V and Mi-35 *Hind* attack helicopters. This occurred after sanctions were imposed on JSC Russian Helicopters by the US Treasury Department following Russia's annexation of Crimea in 2014.

The procurement of spare parts from Russia was effectively stopped by the US government, although it occasionally funded the overhaul of some Mi-8/17s in Bulgaria and the Ukraine. India bought and donated seven former Belarusian Mi-24Vs to the AAF between 2015 and 2019, but they were grounded when Russian spare parts could not be obtained.



Above: ***Two AAF A-29Bs – serials YA-1408 and YA-1510 – of the Kabul Air Wing conduct a training flight on August 14, 2016. Their current fate is unknown*** *USAF/Staff Sgt Larry E Reid Jr*
Insert: ***An A-29B of the Kabul Air Wing is loaded with an inert 250lb Mk81 bomb. Before the collapse of the AAF, this was one of the main weapons used by the pilots, as many lacked the knowledge of working with GBU-12/58s or APKWS IIs*** *USAF/Staff Sgt Alexander W Riedel*



Above: ***This former USAF C-130H – serial 74-1675 – is one of three Hercules transports that were in service with the AAF until Kabul fell into the hands of the Taliban. Their engines could have been sabotaged by the US Army to prevent any future use by the Taliban*** *USAF/Staff Sgt Jared J Duhon*
Below: ***These Cessna 208B Grand Caravans of the Kabul Air Wing are believed to have been used by Afghan government officials, including former-President Ashraf Ghani, to flee to Tajikistan. They are seen here on February 18, 2017*** *USAF/Staff Sgt Jared J Duhon*



Taliban Air Force: Rebirth

The operational use of two Herat-based Mi-8MTV-1s by the Taliban on August 13 serves to mark the rebirth of its air force, which had ceased to exist after the US-led invasion in 2002.

These two helicopters are not the only AAF air assets that fell into Taliban hands. US intelligence officials believe around 40 operational fixed-wing aircraft and helicopters have been captured by the Taliban, which due to the absence of pilots and technicians are unusable for the extremists.

While the Taliban could operate Mi-8/17 helicopters, the majority of operational helicopters captured are US-built, including five-to-seven fully operational MD530F light attack helicopters. According to the images released by the extremists in Mazar-i-Sharif, the Taliban has also captured an unknown number of fixed-wing aircraft, including at-least one A-29B light attack aircraft.

According to US intelligence reports, the Taliban has also captured a large number of Cessna 208Bs, among them are also several AC-208B Eliminators. Most were operational when they were captured.

As a replacement for the AAF's Mi-8/24 rotorcraft family, the US government planned to supply 159 UH-60A+ Black Hawks and 150 MD530F (G) light attack helicopters to Afghanistan from 2014 to 2020. Later in 2020, these plans were altered as the US government began negotiating a peace deal with the Taliban. As a result, the number of Black Hawks and MD530Fs was reduced to just 53 and 72, respectively. Before the Afghan government fell, the nation had received 53 UH-60A+s and 60 MD530Fs.

Final combat activities

Prior to the Afghan government's collapse, the AAF suffered from a lack of operational aircraft and helicopters. A significant number of these – estimated to be between 42 and 45 – were lost or badly damaged during military operations against the Taliban between March and August 2021, when 15 Afghan airmen lost their lives.

The last two known AAF combat losses were a Mi-17V-5 transport helicopter and a MD530F light attack helicopter – serial 289 – on July 26 and 29, respectively. The first helicopter made an emergency landing in the Nad Ali district of Helmand province and the latter suffered a hard landing in the Bolan area of Helmand. Both had been damaged by heavy gunfire from the Taliban.

As the Taliban advanced towards the AAF airports and heliports during June, they managed to score hits on many of their helicopters using mortar shells, machine guns and rocket propelled grenades. In one case on June 16, 2021, a UH-60A+ was hit by a SPG-9 73mm-calibre recoilless gun during refuelling at a heliport in Ghazni and burst into flames. In another case – on July 12, 2021 – another UH-60A+ was destroyed on the ground after the Afghan National Army (ANA) base in Kunduz was shelled by the Taliban.

During the final days of the AAF's existence, the Taliban assassinated several Afghan pilots while they were off-duty, scaring many others into resigning in the days leading up to the government's collapse. Despite that, a small number of courageous airmen occasionally flew their aircraft against the enemy. The MD530Fs – armed with gun pods and Hydra



Above: ***This MD530F Cayuse Warrior belonged to the Kandahar Air Wing before it was captured by the Taliban. The aircraft – serial 184 – is pictured hovering over the ramp in 2018*** *USAF/Staff Sgt Jared J Duhon*
Below: ***Mil Mi-17V-5s once formed the backbone of the AAF's transport helicopter fleet. Before the collapse of the Afghan government, the majority of them were in storage, including this one from the Kandahar Air Wing, which could become part of a new Taliban-led air force*** *USAF/Tech Sgt Robert Cloys*







unguided rockets – together with the A-29B Super Tucanos, armed with Advanced Precision Kill Weapon System (APKWS) II, laser-guided Hydra rockets, GBU-12/58 laser-guided bombs and 250lb Mk81/500lb Mk82 general-purpose bombs, were used against the Taliban until the afternoon of August 14, when Mazar-i-Sharif fell. On August 13 and 14, Herat and Kandahar fell to the Taliban after the commanders of the ANA's 205th Atul and 207th Zafar Corps made a deal to either surrender their troops to the Taliban or send them to Iran to seek asylum. After these two cities fell – along with Shindand Air Base – the AAF had just two air bases left; one in Mazar-i-Sharif and the other in Kabul. They continued fighting the Taliban until August 14, 2021.



Sikorsky UH-60A+ Black Hawk – serial 80-23450 – of the Kandahar Air Wing is also thought to have been captured by the Taliban. It is seen here during better times in 2018 *USAF/Staff Sgt Clayton Cupit*



This AAF-operated UH-60A+ was captured by the Taliban in Ghazni. It had been left behind as it was a non-operational aircraft *Taliban*

On August 13, an A-29B Super Tucano flying from Mazar-i-Sharif dropped a GBU-12 LGB on a group of Taliban extremists, who had gathered on the outskirts of the city, planning an offensive that night. More bombs were dropped subsequently, resulting in 60 Taliban members being killed and 40 of their vehicles and motorcycles being destroyed.

During the final hours of the Mazar-i-Sharif Air Wing on August 14, a Super Tucano carried out an airstrike against another convoy of Taliban extremists in the Dehdadi district of Balkh province, killing 51 of them and destroying their vehicles and weapons.

Seeking asylum

With the surrender of various corps within the ANA, a large number of US-made weapons and equipment were captured by the Taliban, including: 3,000 M-1151 High Mobility Multipurpose Wheeled Vehicle (HMMWVs or Humvees); M-1152 HMMWVs; International M1224 MaxxPro Mine Resistant Ambush Protected (MRAP) vehicles; Ford Ranger pick-up trucks; M1117 Armored Security Vehicles (ASVs) and M113 Armored Personnel Carriers (APCs).

The AAF commanders did their best to prevent their aircraft and helicopters falling into Taliban hands, but with the fall of the Shindand, Herat and Kandahar air bases, most of their operational aircraft were flown to Kabul.

According to the satellite images from Kandahar Air Base taken earlier this year, 12 operational helicopters and ten fixed-wing aircraft were present at the air base. They included: five Mi-8/17s; seven MD530Fs; three A-29Bs; three Cessna 208Bs and two PC-12/47Es. It's possible that more helicopters, including UH-60A+s, were in operational service with the Kandahar Air Wing, but were not present when the satellite image was taken.



Left: ***An AAF-operated MD530F Cayuse Warrior hovers close to the Kabul ramp in early December 2014. This area of the airport is where the Special Missions Wing resided, as well as the presidential Mi-172 helicopter with square windows*** *USAF/Staff Sgt Perry Aston* *Below:* ***The AAF's most secretive asset is the PC-12/47E SIGINT aircraft. The Special Mission Wing at Kabul International Airport operated all 18 of them, but 11 were flown to Uzbekistan before the fall of the Afghan capital on August 15*** *USAF/Max Blumenfeld*



When Herat Air Base was captured, at least three Black Hawks were left behind in an operational condition: one under maintenance in a hangar and two on the ramp. In Herat, the Taliban also managed to capture two operational Mi-8MTV-1s, including one – serial 578 – which subsequently had been put to use by the Taliban by August 13.

Things changed when Mazar-i-Sharif was overrun during the final hours of August 14, and the ANA's 209th Shaheen Corps surrendered. Just hours before, the commander of the Mazar-i-Sharif Air Wing had ordered personnel to evacuate their aircraft. As a result, several A-29Bs and UH-60A+s were flown to Uzbekistan, while some others including at least two Cessna 208Bs were taken to Kabul.

In the afternoon of August 15, a Taliban delegation flew from Doha to Kabul and then to the presidential palace, where they met Ashraf Ghani and discussed the formation of a transitional government. While Ghani agreed on the formation of a new government, he and several other governmental officials, with their families, quickly returned home to pack their cases. They were then driven to Kabul International Airport, where they ordered the air wing commander to arrange their defections to Dushanbe, Tajikistan's capital, at about 1600hrs (local time), using multiple Cessna 208Bs.

Following the defection of Ashraf Ghani to Tajikistan, Kabul was close to falling into the hands of the Taliban, and the commander of Kabul Air Wing ordered his airmen to evacuate as many aircraft as they could to Tajikistan and Uzbekistan. That included nearly all of the airworthy A-29B light attack aircraft, although a large number of mostly non-operational aircraft – including at least one C-130H – were left behind. These platforms are believed to have been sabotaged by the US Army.

According to official statements from the Uzbekistan Ministry of Defence, 46 AAF aircraft (22 fixed-wing and 24 helicopters) flew to that country, while 585 ANA and air force personnel requested political asylum there.

Additionally, one UH-60A+ made an emergency landing in a farm in the south of the country due to fuel shortages. An AAF A-29B crashed after being involved in a mid-air collision with an Uzbek Air Force MiG-29. The A-29B was one of three Super Tucanos from the Kabul Air Wing, which had requested permission to land at Khanabad Airport in Karshi, but were redirected to Termez Airport by two Uzbek MiG-29s. Both pilots of the A-29B ejected and survived, but were injured.

A satellite image of Termez Airport – taken on August 16 – confirmed the presence of the 22 fixed-wing aircraft and 24 helicopters parked in different parts of the airfield. They included 17 Mi-8/17s; seven UH-60As; six A-29Bs; five Cessna 208Bs; and 11 PC-12s. Also, 16 fixed-wing aircraft reportedly defected to Kurganteppa and Dushanbe in Tajikistan, with 100 or so people requesting political asylum.

It is not clear whether Uzbekistan or Tajikistan will agree to transfer the AAF aircraft back to the Taliban or not. Even if they do, the Taliban will not be able to operate the US-made aircraft because of a lack of maintenance and spare parts support, as well as the absence of all the aircrews. Just like Afghanistan itself, AAF personnel and their families now face an uncertain future.



AAF-operated Mi-24Vs and Mi-35s have been out of service for years. They were all left behind in the aircraft storage yard in Kabul. That being said, it will be difficult for the Taliban to overhaul these helicopters and use them without support from Russia *US Army/Sgt Bob Yarbrough*

ESCAPE FROM KABUL

Dave Allport gives an overview of the massive two-week airlift from Kabul, which extracted thousands of Afghans and many other nationalities fleeing from the Taliban takeover



US Air Force aircrew, assigned to the 816th Expeditionary Airlift Squadron, assist evacuees boarding USAF C-17A Globemaster III 07-7173, from the 436th Airlift Wing/3rd Airlift Squadron, on August 21 during the evacuation at Hamid Karzai International Airport, Afghanistan
USAF/Senior Airman Taylor Crul

After 20 years of war, the final US military personnel departed from Afghanistan one minute before midnight local time on August 30, flying out on the last of six US Air Force C-17A Globemaster III evacuation missions, just 24 hours before the August 31 deadline agreed with the Taliban.

The final US soldier to leave Afghanistan was Major General Chris Donahue, commander of the US Army's 82nd Airborne Division, who was the last person to board the final C-17A before departure. He was preceded by the US Ambassador to Afghanistan, Ross Wilson – the pair being the last two US people on the ground at Kabul's Hamid Karzai International Airport. Over the previous two weeks, the largest non-combat evacuation in US military history had been achieved, in conjunction with numerous allied nations.

In a Pentagon press briefing on August 30, General Kenneth F McKenzie (USMC), commander, US Central Command, formally announced the completion of the US withdrawal from Afghanistan and the end of the military mission to evacuate US citizens, third-country nationals and vulnerable Afghans. He said the last US Air Force C-17A had lifted off from Hamid Karzai International Airport at 1529hrs US East Coast time, or 2359hrs local time in Kabul. While the military evacuation was ended, McKenzie noted that the diplomatic mission to ensure additional US citizens and eligible Afghans who want to leave would continue.

The US mission began in Afghanistan shortly after the September 11, 2001, terror attacks. It was not without a high cost in lives lost. Although it resulted in the death of Osama bin Laden, along with many of his Al-Qaida co-conspirators, it also resulted in the loss of 2,461 US service members along with countless civilians, while a further 20,000 US military personnel were injured.

Airlift under way

Beginning on August 14 and continuing for an 18-day period, US military aircraft evacuated more than 79,000 civilians from Hamid Karzai International Airport. That included 6,000 Americans and more than 73,500 third-country nationals and Afghan civilians. The latter category included those with special immigrant visas, consular staff, at-risk Afghans and their families. In total, US and coalition aircraft combined to evacuate more than 123,000 civilians from Afghanistan since late July, of which more than 79,000 had left since August 14, enabled by US military service members who were securing and operating the



In one flight on the evening of August 15, a US Air Force C-17A carried a record 823 people out of Kabul

airfield, which was surrounded by the Taliban throughout this operation.

McKenzie said: "on average, we have evacuated more than 7,500 civilians per day over the 18 days of the mission, which includes 16 full days of evacuations and more than 19,000 on a single day. These numbers do not include the (roughly) 5,000 service members and their equipment that were sent to Afghanistan to secure the airfield, and who will withdraw on the conclusion of our mission."

He continued: "The numbers I provided represent a monumental accomplishment, but they do not do justice to the determination, the grit, the flexibility and the professionalism of the men and women of the US military and our coalition partners who were able to rapidly combine efforts and evacuate so many, under difficult conditions."



Royal Norwegian Air Force/336 Skvadron C-130J-30 Super Hercules arrives back at Oslo Airport early on August 24, carrying people who had been evacuated from Kabul via Tbilisi, Georgia *Norway MFA*

Planning the evacuation

Providing background to the planning required for the evacuation, McKenzie said that, when the president directed the complete withdraw of US forces from Afghanistan in April, the team at US Central Command began to update and refine the existing plan for a potential non-combatant evacuation operation (NEO) in Afghanistan. He said: "We had a framework of plans that included numerous branches and sequels depending on the nature of the security environment. Over time, we continued to refine our plans, which included the interagency, the international community and other combatant commands."

McKenzie continued: "Plans such as this are built upon a number of facts and assumptions, [which can] change over time. While observing the security environment deteriorate, we continued to update our facts and assumptions. As the security situation rapidly devolved in Afghanistan, we took a number of actions to position ourselves for a potential NEO, based upon direction from the Secretary of Defense. We positioned forces in the region and put them on increased alert. We began to pre-position supplies, and we began some preparatory work on intermediate facilities in Qatar, with the support of our gracious host nation."

When the evacuation was formally directed on August 14, the US began to carry out the plan, based upon the initial assumption that the Afghan security forces would be a willing and able security partner in Kabul, defending the capital for a matter of weeks, or at least for a few days. However, within 24 hours, as has been witnessed, the Afghan military collapsed completely, opening up Kabul to the Taliban's swift advance.

On August 15, in a meeting with Taliban senior leadership in Doha, McKenzie delivered a message on behalf of the US president that the mission in Kabul was now the evacuation of Americans and allied partners, and that the US would not tolerate interference and would forcefully defend its forces and the evacuees, if necessary. The Taliban's response in that meeting was in line with what it had said publicly: while it stated its intent to enter and occupy Kabul, it also offered to work



Above: ***The incredible sight of the cargo hold of US Air Force C-17A 01-0186, callsign RCH871, from the 436th Airlift Wing's 3rd Airlift Squadron, during its record-breaking evacuation flight on August 15. It carried 823 people out of Kabul to Al Udeid Air Base in Qatar*** *USAF*

Below: ***German Luftwaffe Airbus A400M 54+23 taxies in at Tashkent International Airport, Uzbekistan, on August 17, on another evacuation flight from Kabul. Being relatively close to the Afghan capital, Tashkent was used as a hub by the Luftwaffe, so that its A400Ms could quickly extract as many people as possible from Kabul before flying them onwards in other aircraft*** *Bundeswehr*



Below: ***Evacuees disembark from US Air Force C-17A Globemaster III 00-0180 – from Air Force Reserve Command's 911th Airlift Wing/768th Airlift Squadron – on August 23, at Al Udeid Air Base, Qatar, as a second C-17A lands behind it. Al Udeid was used as a staging point for outbound evacuees and as a base for supporting tanker aircraft*** *USAF/Airman 1st Class Kylie Barrow*





Over two weeks, the largest non-combat evacuation in US military history had been achieved

Evacuees from Afghanistan disembark from a US Navy Boeing C-17A Clipper at Naval Air Station Sigonella, Italy, on August 28. Sigonella became a major hub for the evacuation process *US Navy/Mass Communication Specialist 1st Class Kegan E Kay*

with the US on a deconfliction mechanism to prevent miscalculation while opposing forces operated in close quarters. Finally, the Taliban promised not to interfere with the withdrawal.

Within 48 hours of the NEO execution order, the situation on the ground had changed significantly. The US had suddenly gone from co-operating on security with a long-time partner and ally to initiating a pragmatic relationship of necessity with a long-time enemy. To maintain security on the ground during the evacuation, the US deployed thousands of troops to Kabul – specifically to make the airport secure for the evacuation flights.

As the evacuation was being completed, McKenzie said there were a total of 73 aircraft being left on the ramp at Kabul. He stated: "Those aircraft will never fly again [now that we have] left. They'll never be able to be operated by anyone. Most of them were non-mission capable to begin with, but certainly they'll never be able to be flown again." Whilst he did not go into details, it is known that the majority of these were Afghan Air Force aircraft. Although, they also included seven US Department of State Air Wing CH-46E Sea Knights, which had already been disabled, so that they could not be used – see 'US State Dept abandons seven CH-46Es in Kabul', p26.

In terms of aerial protection for the evacuation, McKenzie noted: "We had overwhelming US airpower overhead, should there have been any challenge to our departure. And, again, there was absolutely no question: we were not going to be challenged by the Taliban. If we were going to be challenged, it was going to be by ISIS."

In answer to a question from the press, regarding future civilian flights from Kabul, McKenzie said: "We need the airport to be operational, and we need [it] to be operational quickly for civilian traffic. So, we're going to do everything we can to help with that. [Some] of the things we did not demilitarise as we left were those pieces of equipment that are necessary for airport operations – such as the fire trucks and front-end loaders. So, [those are] available to [enable] that airport to get back and get operating as soon as possible."

This will be vital for the safe departure of any remaining people who are able to leave, which the US Department of State will work very hard to achieve. McKenzie went on to confirm that "every single US servicemember is now out of Afghanistan. I can say that with 100% certainty".

Intense operations

The unexpectedly swift overrun of the entire country caught everyone by surprise and

CRAF activation

To assist with the mission, on August 22 US Secretary of Defense Lloyd J Austin III announced that he had ordered the Commander of US Transportation Command (USTRANSACOM) to activate Stage I of the Civil Reserve Air Fleet (CRAF) programme. CRAF activation provided the US Department of Defense access to commercial air mobility resources to augment support to the US Department of State in the evacuation of US citizens and personnel, Special Immigrant Visa applicants and other at-risk individuals from Afghanistan.

The activation was for 18 aircraft: three each from American Airlines, Atlas Air, Delta Air Lines and Omni Air; two from Hawaiian Airlines; and four from United Airlines. The Department said it did not anticipate a major impact to commercial flights from this activation. CRAF-activated aircraft did not fly into Hamid Karzai International Airport – they were used for the onward movement of passengers from temporary safe havens and interim staging bases. Activating CRAF increased passenger movement beyond organic capability and enabled military aircraft to focus on operations in and out of in Kabul.

This was only the third CRAF activation in the history of the programme. The first occurred in support of Operations Desert Shield/Storm from August 1990 to May 1991, and the second for Operation Iraqi Freedom from February 2002 to June 2003.



A US Army CH-47F Chinook – assigned to the 82nd Combat Aviation Brigade, 82nd Airborne Division – being loaded onto US Air Force C-17A Globemaster III 06-6154 at Hamid Karzai International Airport on August 28 *USAF/Master Sgt Alexander Burnett*



Other nations provide support

The US evacuation mission was dubbed Operation Allies Refuge, while other country's evacuation missions included Operation Accordion (Australia), Operation Red Kite (Belgium), Operation Aegis (Canada), Operation Devi Shakti (India) and Operation Pitting (UK). Numerous nations were involved in the airlift, including Australia, Belgium, Canada, the Czech Republic, Denmark, France, Germany, Hungary, Italy, Luxembourg, the Netherlands, New Zealand, Pakistan, Poland, Russia, Qatar, Spain, Sweden, Turkey, the UAE, the UK and Ukraine.

It was not only the US that was carrying record loads during these operations. In one Royal Air Force C-17A flight flown by 99 Squadron, the aircraft carried 436 passengers. While nowhere near the number carried by the USAF Globemaster III mentioned in this article, it was a record for an RAF example, which is normally only configured for a maximum passenger limit of 188.

the planned progressive build up of the air evacuation flights that began on August 14 suddenly changed overnight when the Taliban swept into Kabul.

As a result, after the fall of the city on August 15, the tempo of operations dramatically increased, as every effort was made to get eligible people out of Kabul as quickly as possible.

On August 15, US Department of Defence CH-46E Sea Knights, along with US Army CH-47F Chinooks and UH-60 Black Hawks, flew staff out of the US Embassy compound in Kabul to the airport. This was deemed the safest method of transport, rather than trying to make a dangerous journey by road. As the situation in the city rapidly deteriorated, thousands of Afghan citizens flocked to the airport that same day, breaking down barriers and flooding the airport tarmac. This caused major safety concerns, resulting in US Army AH-64E Apache Guardians flying low over the airfield to try to clear the crowds and enable safe aircraft departures.

During the chaos, one C-17A was seen with crowds of Afghans running dangerously close alongside it as it taxied out. Two people were later seen falling to their deaths as the aircraft took off – they had apparently tried to stow away in the undercarriage, such was their desperation. The crowds temporarily disrupted evacuation operations, but flights were resumed on August 17.

In one flight on the evening of August 15, a US Air Force C-17A carried a record 823 people out of Kabul. The aircraft involved was serial number 01-0186, callsign RCH871, from the 436th Airlift Wing's 3rd Airlift Squadron 'Third but First' at Dover Air Force Base, Delaware. Despite this heavy load, it later landed safely at Al Udeid Air Base in Qatar.

Further emphasising the dangers on the ground, a suicide bomb attack on the Abbey Gate at Hamid Karzai International Airport on August 26, killed 13 US troops and over 110 Afghan civilians, while injuring 100 more.

In a NOTAM (Notice to Airmen) issued on the morning of August 16, Afghan airspace was 'released to the military' due to the security situation. The NOTAM stated that any aircraft flying through the Kabul FIR (Flight Information Region) would be flying in uncontrolled airspace and did so at their own risk. All passenger aircraft were advised to find alternative routes, as there would be no air traffic control (ATC) support. The US military then took over operations at the airport, including ATC.

Mission conclusion

As operations wound down near midnight on August 30, the final six USAF C-17A flights departed from Hamid Karzai. These comprised 09-9211 (callsign 'MOOSE 81'), 07-7181 (MOOSE 85), 07-7185 (MOOSE 94), 08-8197 (MOOSE 86), 07-7182 (MOOSE 83) and 07-7173 (MOOSE 88), which appears to have been the final US military aircraft to depart.

Tanker support for these last departures had been provided by a fleet of USAF KC-135R/T Stratotankers, something that had been necessary from the outset. This was not only because there was no fuel available at Hamid Karzai, but also so that the aircraft could leave with minimum fuel, to reduce take-off weight and enable departure with the maximum number of people on board. Once airborne, they then topped up their tanks from the tankers.

The KC-135s did not land in Kabul but remained constantly available to supply fuel to the transport aircraft in the air, after they departed. The final tanker noted was KC-135R 63-7976, which was tracked leaving Afghanistan airspace and crossing over into Pakistan airspace around 0130hrs on August 31. At roughly the same time, KC-135T 60-0343, plus KC-135Rs 58-0124, 61-0310, 61-0314 and 62-3554 were all noted further south, along with KC-10A Extender 82-0191 'MOJO 84' all heading westbound over the Gulf of Oman, having completed their final tanking support missions. Thus ended the largest ever US military non-combat evacuation in history, which took 116,700 people to safety. AFM



Last man out: Major General Chris Donahue, commander of the US Army's 82nd Airborne Division, about to board the final C-17A to leave Hamid Karzai International Airport shortly before midnight on August 30 *US CENTCOM*

In total, US and coalition aircraft combined to evacuate more than 123,000 civilians from Afghanistan



While the majority of flights in and out of Kabul were military, some civilian aircraft were also used for the evacuation. One such was this Airbus A320-231, YR-SEA, operated by Romania-based Star East Airlines, seen here on August 25 *USMC/Cpl Davis Harris*



Above: **From left: Rick 'Ricko' Offord, HHA's flight safety officer; Simon Hargreaves OBE, the company's director of flight ops; and Wg Cdr Nige Driscoll, officer commanding the RAF Central Flying School Exam Wing; pose in front of Hunter T72 – serial XE688 – following completion of Hargreaves' annual Instrument Rating Examiner Test June 23, 2021** *Khalem Chapman*

Insert, right: **A company patch** *HHA*

Below: **HHA owns a fleet of ten single-seat Hawker Hunter Mk58s (pictured) and one two-seat T72, all of which are powered by the Rolls-Royce Avon 200-series engine** *HHA/Andy Shelton*



What was forecast to be a gloomy, drizzly day turned out to be quite the opposite. Having arrived at the front gate of fast-jet contractor Hawker Hunter Aviation – known as HHA – the skies were a pleasant shade of blue, with the sun beating down on RAF Scampton, Lincolnshire, as the company was preparing to launch its afternoon flight operations.

That day in mid-June, Simon Hargreaves OBE – director of flight ops at HHA – was conducting his annual Instrument Rating Examiner's Test under the watchful eye of Wg Cdr Nige Driscoll, officer commanding the Exam Wing at the Royal Air Force's Central Flying School (CFS), located at nearby RAF Cranwell.

A distinguished Sea Harrier pilot with the Royal Navy and a veteran test pilot, Hargreaves is admired for his services to aviation and for being the first to fly Lockheed Martin's X-35B – the prototype of the short take-off and vertical landing variant of the Lightning II family – during the Joint Strike Fighter programme.

Hargreaves and Driscoll thundered into the glorious Lincolnshire sky aboard HHA's recently acquired Hawker Hunter T72. Following which, *AirForces Monthly* sat down with three ranking members of the HHA's management team: Mat Potulski, the managing director and owner; Stuart Grant, the quality manager; and Rick 'Ricko' Offord, a tenured fast-jet pilot and the company's flight safety officer (FSO).

We discussed HHA's 21-year history; the aircraft fleet; regulatory approvals; recent operations; ambitions and the common

misconceptions surrounding the Hunter's suitability for supporting modern military trials and training operations, given that the platform is now viewed by many as a 'museum piece'.

What is HHA?

Founded by Potulski in 2000 and headquartered at RAF Scampton, HHA is a Military Aviation Authority (MAA) approved and regulated Defence Contractor Flying Organisation (DCFO), which maintains and operates its own multi-platform fast-jet fleet on the UK Military Aircraft Register (MAR).

Via its suite of MAA Regulatory Approvals – covering Contractor Flying Approved Organisation Scheme (CFAOS), including Flight Test; Maintenance Approved Organisation Scheme (MAOS); Continuing Airworthiness Management Organisation (CAMO) and Design Approved Organisation Scheme (DAOS) – the company provides a solution for trials support, mission support training and aerial threat simulation for the UK Ministry of Defence's (MOD's) requirements, either through direct prime contracts or via subcontracts with industry.

Potulski explained: "What we undertake is principally trials support activities for MOD-related projects or international projects that are supported by British industry.

"We provide one or more aircraft to carry a piece of equipment that needs to be trialled or aircraft that act as co-operative targets for aerial, land and/or maritime equipment that is being developed. Other taskings include work with Test Pilots' Schools and we also undertake some threat simulation work."

Old dogs, new tricks



Khalem Chapman goes behind-the-scenes with the often publicity-averse Hawker Hunter Aviation company at RAF Scampton to discuss its fleet and operations, future hopes and the Hunter's suitability for supporting military trial efforts



"In terms of hours, our fleet average is 2,500hrs total time versus some MOD Hunters that were approaching 10,000hrs. Indeed, many of the Hawk T1s in MOD service flying around now have clocked up close to 10,000hrs too!"

Mat Potulski, managing director and owner of HHA



A pair of Hunter Mk58s fly in tight formation during a sortie
HHA/Andy Shelton

Before HHA was established at the turn of the millennium, Potulski had become involved with the Old Flying Machine Company (OFMC) at Duxford Airfield, Cambridgeshire, which was when the idea to create the new defence contractor organisation first came about.

Potulski continued: "In the mid-to-late 1990s, the idea of outsourcing some military training activities to industry had just started, especially in the US… I took the Hunter aircraft that I owned, which were being operated under the OFMC umbrella, and founded HHA out of it.

"As to how successful it's been within our 21-year existence, well we're still here and that's quite a good thing, so it shows we must be doing something right. The irony is that when I set it up it was with the aim of undertaking threat simulation, but in fact our principal current activity is trials support. Air forces these days simply do not have enough aircraft to undertake secondary roles such as industry trials support functions, which is where we come in. Short turn-around times, cost effectiveness and the scope of what we can do are appealing to our customer base.

"Conversely, we haven't yet broken through properly in the threat simulation sphere and the primary reason for that is to date there have been very few contracts that cover this area."

Potulski explained that as a subcontractor in MOD prime contracts, HHA also plays a crucial role in the delivery of those contracts: "A number of UK-based defence companies have prime MOD contracts to develop various weapons systems. But to do that, they need aircraft to carry the kit and HHA is hired to develop the aerial aspects of the trials, modify and certify aircraft and of course actually execute the sorties carrying their equipment. They have the prime contract – not us – but without us being there, they would not be able to meet their prime contracts because they would not be able to test and develop their equipment."

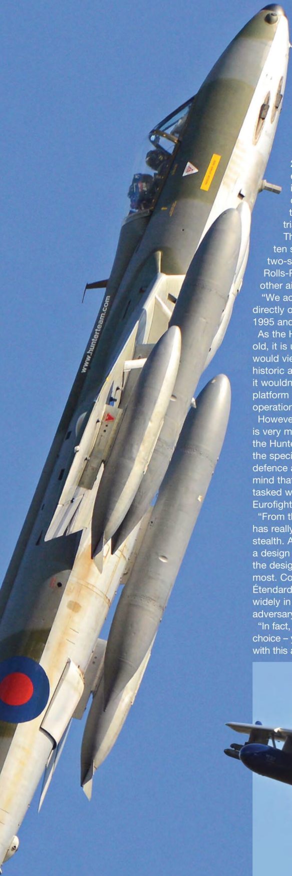
Additionally, HHA works with foreign defence ministries and industry. "For example, we had a contract in Italy," Potulski continued. "An Italian shipyard was building a helicopter carrier and they needed aircraft to act as co-operative targets for the anti-aircraft weapons systems on that carrier. We were

"It's basically twice the weight and twice the power, but can carry external fuel tanks and stores and will remain on-task longer than a Hawk. It's chunkier and feels 'heavier', but it's a lovely airplane to fly"
Rick 'Ricko' Offord, HHA's flight safety officer





Left: ***Hawker Hunter Mk58, serial ZZ191, comes in to land at RAF Scampton after a sortie***
HHA/Andy Shelton
Right: ***Although the Hawker Hunter design is now 70 years old, the platform is still perfectly suited for conducting the trials support and threat simulation operations that are required of it by the company and its defence and industry partners***
HHA/Andy Shelton



brought in to do it and supported British exports due to the UK equipment installed on the vessel."

Youthful Hunters

As its name suggests, HHA is synonymous with the famed Hawker Hunter – the British-designed multi-role fighter, the prototype of which first graced the skies on July 20, 1951, with a production run that ended in 1976. Additionally, the firm is the only European-based defence contractor that continues to operate the type in support of modern military trials and activities.

The company currently owns a fleet of ten single-seat Hunter Mk58s and a single two-seat Hunter T72, all powered by the Rolls-Royce Avon 200 series engine. Various other aircraft are in storage.

"We acquired most of the Hunters either directly or indirectly from the Swiss between 1995 and 1999," Potulski explained.

As the Hunter design is now several decades old, it is understandable why many observers would view the type as a 'beautiful relic, historic aircraft or museum piece' and that it wouldn't necessarily be the most suitable platform for supporting military trials/training operations in the modern age.

However, Potulski stresses that this view is very much a misconception, adding that the Hunter is perfectly suited for conducting the specific roles required by HHA and its defence and industry partners, bearing in mind that these aircraft are not comparatively tasked with mission sets akin to those of the Eurofighter Typhoon or F-35.

"From the early 1960s, the design of aircraft has really focused on supersonic, agility and stealth. All come at considerable costs. As a design for a high subsonic tactical aircraft, the design is of its time and in fact better than most. Contemporaries are the A-4, Super Étendard, A-7, etc, and the Hunter is still widely in service with companies delivering adversary training.

"In fact, the Mk58 (Swiss AF) is the platform of choice – you get the maximum bang for buck with this aircraft in terms of speed, endurance and manoeuvrability; the 'knee in the curve'. The cost of increasing any of these parameters is disproportionate to the gain. As far as the pure performance of the air vehicle in the subsonic sphere, it is still representative and serves our current trials support purposes very well.

"In terms of hours, our fleet average is 2,500 hours total time versus some MOD Hunters that were approaching 10,000 hours. Indeed, many of the Hawk T1s in MOD service flying around now have clocked up close to 10,000 hours too!

"Another misconception pertains to the supportability or otherwise of the aircraft. Modifications that we have introduced address most of the obsolescence issues whilst service contracts with industry have been established for virtually every consumable part. The reality is that we have found them to be readily supportable, as evidenced by our high sortie success rate, because a specialist support infrastructure has been set up!

"This, in combination with their low flying hours and fatigue, means that technically, we could fly the Hunter for many years to come. Whether we continue to use them that long really depends on the effect delivery the customer requires in a defined operating environment and role (i.e. whether this sits within the veteran jet's performance envelope), rather than fatigue or technical supportability constraints. A further factor to consider is that in the roles we use the aircraft, it's a platform, a simple 'transit van', to carry the 'brains' (i.e. the trials or emulation equipment into a piece of sky). Therefore, as long as the platform meets certain performance criteria, the effect

Staffing HHA

Presently, the company employs around 20 people. Of those, approximately half are maintainers and pilots with the rest working to support the firm on the business, commercial and regulatory fronts.

"Our maxim is scalability," said Potulski. "We want to be able to respond relatively quickly to new opportunities and therefore have a strong network of contacts in place so that if we did have to hire, for example, extra suitably qualified and experienced personnel we are in a good position to recruit quickly and have the processes and training packages in place to upscale."



The newest addition to the fleet is Hunter T72 – serial XE688. This two-seat aircraft formerly served as Embraer's flight test chase plane under the Brazilian registration PP-XHH, before it was purchased by HHA. It arrived at RAF Scampton, Lincolnshire, in September 2018 *HHA/Andy Shelton*



While HHA will no longer be acquiring an airworthy former-Luftwaffe McDonnell Douglas F-4F Phantom II from Germany, it intends to retain the non-flying ground instructional airframe – serial 72-1199/37+89 – as a reminder of what might have been if the full acquisition had been completed HHA/Andy Shelton



The Buccaneer S2B was procured in 2000 to cover a requirement for an aircraft that could carry a large payload, but it did not materialise HHA/Andy Shelton

delivery will be generated by customer or GFE-supplied on-board systems carried 'in the back of the van'," Potulski explained.

Clockwork aircraft

One of the reasons HHA chose the ex-Swiss Hunter platform versus more modern legacy types for the trials support environment is that it was specifically looking for a mechanical aircraft – one with manual controls and without a flight management system, data bus, FADEC or anything else that complicates the clearance of externally or internally mounted radio frequency (RF) emitters. "When you combine this requirement with a suitable performance envelope, the ability to carry various stores and through-life cost factors, you come up with something like the Hunter," Potulski said.

Operating a fleet of legacy aircraft requires expertise, experience and innovation. The continuing airworthiness challenges presented by this class of aircraft are slightly different from the challenges posed by 'modern' aircraft. The box change methodology does not yield results because of the design of the aircraft and its systems.

Hence, there is a reliance not just on support infrastructure, but also on suitably qualified, experienced personnel, who are encouraged to be innovative and proactive problem-solvers dealing with equipment that was designed to be repaired rather than replaced, while always operating within the regulations.

Hawk T1 'on steroids'

Hunter Qualified Flying Instructor Rick 'Ricko' Offord is a 5,000-hour fast-jet veteran on types including the Phantom FGR2, Tornado F3 and F/A-18A/B Hornet. Throughout our conversation about flying the Hunter in the modern era, comparisons between it and the Hawk T1 were often used. "The Hunter is of a very similar performance," HHA's FSO said. "It's basically twice the weight and twice the power, but can carry external fuel tanks and stores and will remain on-task longer than a Hawk. It's chunkier and feels 'heavier', but it's a lovely airplane to fly.

"It has some idiosyncrasies. For instance, flying in manual, which I had never done before in my flying career. Basically, in manual, the stick is directly attached to the flying controls rather than via hydraulic actuators. If you lose all hydraulics for whatever reason (such as a total engine failure), you can still land the Hunter in manual. I've not known any other fast-jet able to do that."

The aircraft are currently undergoing a major partial glass cockpit modernisation. "With this, we've got everything we need as far as civilian [and] military interface approvals. We have Automatic Dependent Surveillance-Broadcast (ADS-B), Traffic Collision Avoidance System (TCAS) and Terrain Avoidance and Warning System (TAWS).

"With the new equipment we've got in the partial glass cockpit, you've got great situational awareness. You know where terrain, runways and other aircraft are… I was doing a trial at low-level over the North Sea and a wind farm showed up on my MFD. As you get closer to the wind farm, the pylons actually grow on the 'telly'." He repeated: "It's a lovely airplane to fly," adding, "with the upgrades, it's fantastic!"

Today, student pilots on any military type have become used to training syllabuses that incorporate both synthetic and live training methods using simulators and digital fly-by-wire aircraft. In truth, synthetic training methods will become increasingly more commonplace in air forces by the mid-2030s. Offord thought today's young pilots would be entering a 'new world' of flying if they were to convert to a Hunter: "They would find it interesting because modern airplanes use fly-by-wire flight controls. Unless you've flown something older than a Tornado vintage, where you've been used to not quite manual controls, but hydraulically operated flight controls, as opposed to fly-by-wire, you would probably struggle for the first few hours in a Hunter – it is different. The HHA aircrew Hunter type conversion programme specifically caters towards gaining familiarity with the type's idiosyncrasies and is one of the reasons we place so much emphasis on aircrew selection when undertaking conversion on type."

Below: **HHA's former-Luftwaffe Sukhoi Su-22M4 is the only one of its type in civilian ownership that is potentially airworthy. However, it is unlikely that the company will have a flying requirement for it now, so it remains in long-term storage at RAF Scampton** HHA/Andy Shelton





Recent ops

While HHA couldn't divulge its current trials operations due to security classifications of the work, Offord was able to provide a broad example of a recent trials support mission relating to the development of a new weapon system: "The customer had requested that a Trials Platform Aircraft was created by modifying a twin-seat Hunter to carry specific trial equipment together with various bespoke monitoring and control instrumentation controlled by a Flight Test Observer (FTO) in the right-hand seat. We'd previously trained a number of customer staff to undertake the FTO duties, which included aircraft familiarisation, survival training and so on. They wanted me to look at a bunch of different targets, specifically at different heights, speeds and target offsets."

The basic objectives and sortie profiles had been developed many months earlier and articulated as part of the overall Trials Instruction: "We brief the specific sortie in the morning, the customer gives us exactly what he wants to see, what heights, what speeds and where exactly. Without going into details, it's super specific and complicated flying and can be as fast/low as 600kts at 250ft over land (or 50ft over sea).

"In another sortie, the customer wanted me to fly a descent profile from high altitude, pointing exactly at whatever target they wanted to look at. Once again, to plan that at a specific ground speed and exact ground track is greatly assisted by the avionics now in the aircraft. Each trial and sortie has been bespoke, has taken much background planning and preparation and the actual flying and execution is just part of the programme," he said. "All of these demonstrate the capability and breadth of HHA's assets and human resources."

Additionally, HHA supports test pilot training operations. It provides test pilot schools with aircraft and safety pilots to augment its in-house platforms for various student exercises.

Regulated and approved

HHA aircraft operate on the UK MAR, principally because they undertake activities that fall outside the normal remit of the civilian Air Navigation Order. "We undertake quasi military trials and training activities in aircraft of military design origin, often in military airspace interacting with military units, so it makes sense that we come under the regulatory oversight of a military body," added Offord.

Quality manager Stuart Grant described the company's relationship with the MAA and why it is so important to the company's customers to contract with a firm whose aircraft are on the UK MAR.

HHA's four overarching sets of approvals are all audited by the UK MAA. Grant said: "Our income depends on the flight activities



Hawker Hunter Mk58 – serial ZZ191 – in flight on October 23, 2015. Note the aircraft is wearing a unique arctic splinter camouflage. The company plans to apply variations of this scheme to its other aircraft in the long term HHA/Andy Shelton

A 'Phantom Menace'

When speaking previously with Mat Potulski regarding HHA's acquisition of an airworthy F-4F Phantom II from Germany, it was clear there was a buoyancy and excitement for its arrival in the near term. However, on *AFM's* arrival at RAF Scampton in June, the mood seemed to have changed – the acquisition had been scrapped by the Germans for no apparent reason.

"The whole seven-year HHA F-4F saga is an example of how we would try to source an alternative type of platform if the customer's requirements fall outside the performance envelope of the Hunter. In 2013, we were contacted by one of our defence partners and customers with regard to an ongoing and sustained tasking requirement, which required us to operate a twin-seat supersonic aircraft without a flight management system, but must have a 'modern' radar, digital databases and the ability to carry various stores and equipment," explained Potulski.

"That led us to look for a supportable supersonic platform and, with the Luftwaffe F-4Fs being retired, they were the obvious choice. We knew that these had not only been perfectly maintained, but that this was complemented by a very reliable paperwork record and access to a full suite of spare parts, engines and industry that still supports the type. We set up an 11-man team in Germany to be able to overhaul the aircraft for us whilst the CAMO, DAOS and CFAOS side of things would be undertaken by HHA UK. A ground instructional airframe was also purchased and relocated to Scampton to familiarise UK staff.

"The designated 'flyer' – serial 38+48 (formerly 72-1258) – had been chosen as the lowest FI airframe and stored for us in Germany; MAA Approval in Principle to place on the UK MAR as ZK848 had been granted; the End Use Certificate and US and UK approvals were in place, all necessary spares and GSE collated next to the aircraft, maintenance and training packages arranged, etc.

"Then COVID-19 struck, and we could not access the airframe and spares, so at the Germans' behest, we arranged to have everything moved by road to the UK, rather than undertake the overhaul in Germany as had originally been planned. Routes had been surveyed, transport and crane companies were standing by, even the removal of a fence at Jever Air Base – where the aircraft was stored – to facilitate oversize access had been arranged.

"But, after seven years of convoluted negotiations, after all parties had in principle agreed the deal, draft contracts were ready for signature and for reasons unknown to us, the German disposal agency pulled the plug overnight and said that they are not selling the aircraft, so the project with the Phantoms has now been cancelled.

"The contractual tasking requirement still exists, but we have not as yet identified an alternative air system. We will keep the ground instructional F-4F airframe here as a mascot and reminder of what could have been… but we're not going to go to Israel, South Korea or Greece to buy a Phantom there because the whole point behind the German F-4Fs was having their provenance – the knowledge that EADS or LIG 21 had been through them with a fine-tooth comb every six years and that they were just in an immaculate condition," he concluded.

It was also noted that the Buccaneer and Su-22M4 – which the firm has in long-term storage – would not be suitable for fulfilling the requirements for which HHA had been sourcing the Phantoms.



Above: ***Mat Potulski highlighted his continued interest in growing HHA into a company that can provide COCO adversary air training to the UK MOD. Despite the company's Hunter heritage, it is platform agnostic and can evolve to meet new military/industry requirements, if needed*** *HHA/Andy Shelton*
Below: ***One of the unique features of the Hawker Hunter is its ability to be flown in manual. This means the stick is attached directly to the controls rather than its hydraulic actuators. For instance, if the aircraft's hydraulics fail, the pilot is still able to control and land the platform*** *HHA/Andy Shelton*





Some of HHA's fleet are in long-term storage, like this former-Swiss Air Force Hunter Mk58 *Khalem Chapman*

of the aircraft, so at the top of our pyramid sits our CFAOS approval, which covers the flight ops (including flight test). All the other approvals we hold are there to ensure the safe operation of our aircraft – MAOS covers maintenance activities; CAMO covers continuing airworthiness management and DAOS covers the type airworthiness (ie, design aspects)."

These are governed by MAA regulatory publications (MRP) which include overarching documents, regulatory articles and manuals. However, holding MAA approvals and having its aircraft on the MAR comes with a heavy burden of responsibility for HHA. Grant said the company's quality department runs an extensive assurance programme with more than 75 independent quality audits being conducted each year. It must also ensure there is adequate confidence and evidence of compliance with the MRP to satisfy MAA external audits and remain a fully approved organisation. This message was reinforced by Potulski. He said: "The management and maintenance of our various approvals is an ongoing activity which consumes a considerable amount of effort and resource but is of paramount importance to us since not



only do they manage safety but also act as the enabling tool for everything we do."

Potulski added: "A great advantage is of course that the majority of our customers are audited and assured by exactly the same audit teams and regulators as ourselves and hence we speak the same language. That means that the training, maintenance, continuing airworthiness practices and the Air Safety Management Systems mirror, and can readily integrate with, those found within any UK military unit."

HHA has a proactive approach to the ever-evolving regulations, where the emphasis is on accountability, assurance and safety. "We welcomed the transition from the old, pre–Haddon-Cave 'Byzantine' regulations to the MRP and the introduction of the CFAOS scheme, which has enabled us to understand our risks more clearly and hence are able to mitigate effectively," Potulski added.

Quest for 'Red Air'

The rise of 'Red Air' contractors – particularly in the US – has been one of the biggest developing stories of the last decade. This culminated in the US Air Force awarding several companies a share of a US$6.4bn contract to provide contractor-owned, contractor-operated (COCO) adversary air training to combat air forces across the continental US.

Recently, the UK MOD has also ventured into the realm of exploring COCO-based 'Red Air' opportunities, although each of its previous programmes failed to take-off – from the demise of the Air Support Joint Training Readiness project, the MOD launched its Air Support Defence Operational Training programme, which was also scrapped.

The UK MOD is now exploring 'Red Air' opportunities again with the Next-Generation Operational Training (NGOT) programme, although its requirements have yet to be announced. The British government has confirmed its intention to retire the RAF's hard-used Hawk T1s from service next March, followed by its early Tranche 1 Eurofighters by the end of 2025, leaving the service with no platform to cover an adversary air training role and no identifiable replacement. This opens the door for the MOD to outsource its 'Red Air' requirements to industry – and HHA is one of those contractors that would be interested in aspects of the NGOT contract.

"The biggest challenge here is actually the very onerous regulatory, operating and assurance structure for compliant operations in UK airspace and we have developed a 15 plus-year track record in that, as evidenced by our suite of MAA regulatory approvals and successful delivery of missions/tasks for our customers over those years," Potulski said.

"We have an expertise in taking legacy platforms, updating them with more modern systems and placing them on the UK MAR. However, putting a platform that has never operated on the UK MAR on to the register is an enormous certification and resource challenge. The complexity and time required to gain the requisite corporate operating approvals for an air system to operate on the MAR is, in my opinion, grossly underestimated by many parties.

"In the huge US market, operators are utilising Kfirs, F-16s and so on, but the key difference is that they are operating in the arguably more benign US N reg 'experimental' category. Comparing that with attempting to obtain UK military registration and assurance processes is like comparing chalk and cheese.

"If invited, then of course we would look at NGOT, either with an industry partner or standalone. There are really two exam questions – what is the required effect delivery and what is the available budget to achieve this? Whether we consider NGOT with a modified Hunter or a different platform depends entirely on the customer's requirements, timeframe and so on. If the requirements fall outside the performance envelope of the Hunter – e.g. Mach 2 and an AESA radar – then we'd look at alternative air systems. We're platform agnostic.

"But in all likelihood, a mixed fleet together with a synthetic element will provide the most cost-effective solution," Potulski concluded.

HHA has served as a vital supporting asset in the development of crucial systems and munitions, some of which are already in service. With RAF Scampton set to close in the coming years, operations from there are likely to be cut short, forcing a relocation. That said, the future looks exciting for the company as it anticipates various trials support and threat simulation taskings and continues to support the MOD and industry in an important role. AFM

Buccaneer and Fitter

While HHA's current plans stipulate that the Blackburn Buccaneer S2B and Sukhoi Su-22M4 (NATO reporting name: *Fitter*) will remain in long-term storage for the foreseeable future, the acquisition of such platforms was on the basis that they may – at some point – be needed to fulfil a defence industry requirement.

Mat Potulski explained: "When we purchased the Buccaneer from the MOD in 2000, QinetiQ had retired their three examples, which they had used for trials support purposes. We thought there'd be a requirement for an aircraft that could carry a large payload.

"[We] selected the particular aircraft we have (XX885) because it was the last aircraft to be re-sparred and rewired in MOD service, so it potentially had a long life remaining. We actually bought three aircraft, broke two up for spares and kept this one. That requirement didn't materialise, so we just kept the aircraft in inhibited storage in the hangar.

"With the Sukhoi, I thought there'd be a supersonic requirement when we bought that. It's the only one of its type in civilian ownership that's potentially airworthy anywhere. It came from the Luftwaffe and it's also in storage. We have used it for various ground-based trials, but I don't perceive there to be a flying requirement for it now.

"With both the Buccaneer and Sukhoi, their envisaged roles could have been undertaken by the Phantom, if it had come on board. They're basically two storage airframes, which we'll keep right now. We could reactivate them, but have no plans unless there's a requirement from a client to do so," he concluded.



***Below:* Hunter T72 – serial XE688 – is prepped for a sortie at RAF Scampton. The Lincolnshire base is also home to the Royal Air Force Aerobatic Team, the Red Arrows, and has to schedule its own operations around the display team's practise times**
HHA/Andy Shelton



Below ***The farewell-schemed Transall C-160D, serial 50+40 'Retro Brummel', in flight over Germany on March 16, 2021*** *Stefan Petersen*

Stefan Petersen speaks with Oberst Markus Kleinbauer, the commanding officer of Lufttransportgeschwader 63 – LTG 63, as the unit and its matured Transall C-160Ds enter their final weeks of operation

Auf Wiedersehen LTG 63

The end is very close now. When this year is over, German Transalls will have disappeared from the sky forever. Postponed several times, the decommissioning of the sole remaining C-160D wing of the Luftwaffe (German Air Force) – Lufttransportgeschwader 63 (LTG 63, Air Transport Wing 63) at Hohn in Northern Germany – is set for December 31, 2021.

"We'll be flying to the very end, scheduled by European Air Transport Command in Eindhoven, the Netherlands, then we sign off finally," said Oberst (Colonel) Markus Kleinbauer, the last commanding officer of LTG 63, which is where the era of this twin-engine transport aircraft in Germany began in April 1968.

For 53 years the Transall was a loyal companion of the Bundeswehr (German Armed Forces), transporting personnel and materiel nationwide and abroad. It had flown multiple humanitarian missions all around the world, known as the 'Angel of the Air'.

With the return of C-160D, serial 50+76, to Hohn from Niamey, Niger, the type's last international mission ended on April 29 – at least its last scheduled one. "If an armoured aircraft is needed to fly people into dangerous areas or an evacuation of German citizens from a crisis area becomes necessary, we will be ready until the last day," said Kleinbauer.

The last time such an evacuation was required was in July 2016, when civilians in South Sudan had to be flown to safety out of the civil war-stricken region. As well as transporting about 100 Germans, the four Transalls of LTG 63 also flew 100 citizens of other nationalities out of the nation's capital, Juba.

But supporting German special forces remains the main task of the wing and the Transalls with the bumblebee badge are still flying cargo across Europe and dropping off paratroopers.

"These will be our main remaining tasks until December," Kleinbauer added.

The fleet of 11 C-160Ds will be gradually reduced to seven in the second half of 2021. "These seven will fly until the end," said 51-year-old Kleinbauer, who added that the other four will be given to other air bases as exhibits. "If there is no buyer for the last seven, they will be scrapped," he explained.

Several Transalls that have been withdrawn from active service are already waiting to be scrapped in the wing's large maintenance hangar. "Some parts will be removed for museums, for example, but most of the stuff will be discarded," said Oberstabsfeldwebel (Sgt Maj) Alex Peters of LTG 63's Public Affairs Office (and a former flight engineer, with 5,900 hours on the Transall), while inspecting a decommissioned aircraft.

"It hurts your soul when you see what is being thrown away," he remarked as he moved the throttles one final time in the cockpit. "For me, these are all memories."

In total, 1,300 flight hours are planned for the wing in 2021. "We are even involved in some exercises, but only to a lesser extent – supporting units that need air transport," explained Kleinbauer.

With the phasing out of the aircraft, the number of crews will also decrease from 11 to eight. In addition, there are some pilots in staff assignments like Kleinbauer himself, who has logged a total of 3,700 flight hours – of which 3,300 are on the C-160D. "But not complete crews, as we have no flight engineers and loadmasters in the wing's staff," he added. The remaining crews are mixed in age: "Older and younger ones. Half of them will fly the [Transall's successor], the A400M thereafter."





Right **The badge of LTG 63**

Of the 550 servicemen and women who make up LTG 63, just 200 will continue to maintain flight operations as the end of the year approaches. At one time, there were 1,300 military and civil personnel, with two dozen aircraft under the wing's charge. "Of course, you will find melancholy here in the wing as the end comes closer," Kleinbauer said. The decision to withdraw the Transall and decommission LTG 63 was made in October 2011, but the disbandment was postponed several times. "Now everyone has more or less accepted it in a way, and everyone also knows where he or she will be transferred to after the disbanding."

Despite this, some personnel will remain at Hohn. "In the future, the base will be operated as [an] alternate airfield for all jet wings in Northern Germany," the colonel explained. For this purpose, a small airfield squadron with approximately 60 personnel will be attached to the neighbouring Taktisches Luftwaffengeschwader 51 (TLwG 51, Tactical Air Force Wing 51) 'Immelmann' and stationed at Hohn Air Base (AB). "The infrastructure here will be permanently maintained and the target demo company, GFD, also continues to operate from Hohn. The GFD actually already produces more flight hours than we do," Kleinbauer said. With its 12 Learjet 35As and two 36As, the firm supports the Bundeswehr on target demonstration tasks, both with and without tow targets, as well as for electronic warfare training.

The barracks of the wing in Alt Duvenstedt – a few kilometres from Hohn AB – are being taken over by the Sea Battalion of the German



Above ***A decommissioned C-160D is prepared for disassembling in LTG 63's large maintenance hangar at Hohn AB***
Stefan Petersen

Navy. Kleinbauer added: "230 members are already here and the battalion's strength in the barracks is now growing steadily."

The COVID-19 crisis has prevented both the Transall and LTG 63 bidding farewell to the surrounding region, which the wing has been closely associated with since moving to Hohn from Celle, Lower Saxony, in September 1967. Kleinbauer explained that there was going to be a celebration: "This was supposed to happen on the Tag der Bundeswehr (Day of the Armed Forces) on June 12, but we were only able to perform a virtual event because of the pandemic."

Even the usual representational visits by the CO were limited in recent months due to the virus: "Almost all of the external dates have been cancelled." But a hangar party was being arranged for personnel, their families and other wings in September: "With this party, we say goodbye to the flyers' community of the Bundeswehr."

There will also be a spotter day when the 'Retro-Brummel' – the specially painted 'Last Call' C-160D, serial 50+40 – will take off for a final flight over Germany, accompanied by other Bundeswehr aircraft: "That is the farewell tour," Kleinbauer concluded. Roll call in December will end the 60-year history of the wing and the era of the Transalls in Luftwaffe service. AFM

"If an armoured aircraft is needed to fly people into dangerous areas or an evacuation of German citizens from a crisis area becomes necessary, we will be ready until the last day"
Markus Kleinbauer, commanding officer of LTG 63



LTG 63 will be fully deactivated on December 31, 2021. Until then, it will remain ready to support Germany's ongoing airlift operations with its few remaining C-160Ds
Stefan Petersen

Ru

Flanke

The Su-30SM is now well established in Russian service while also enjoying mild export demand. An enhanced derivative, dubbed Su-30SM2 and currently in development, is primarily aimed at meeting the Russian Naval Aviation requirements, as **Alexander Mladenov** reports



This Su-30SM from the 14th IAP comes equipped with the SAP-518SM radar jammer pods on the wingtips *All images Andrey Zinchuk, unless stated otherwise*

ssia's evolving

ers

The first orders for the affordable yet sufficiently capable multi-role heavyweight fighter were placed by the Russian defence ministry in early 2012. Not long after, the type became the mainstay of the Vozdushno-Kosmicheskiye Sily (VKS, Russian Aerospace Forces) and Aviatsiya Voenno-Morskovo Flota (AVMF, Russian Naval Aviation) tactical jet fleets.

First deliveries were made in December that year and as many as 114 were taken under a series of contracts, which were reportedly completed in 2018. After a four-year pause, from 2022 onwards the Russian military is set to take on strength the significantly enhanced Su-30SM2 derivative, with an initial batch of 21 examples already on order for the AVMF, with more expected to follow.

No doubt, the Su-30SM's procurement by the VKS in the early and mid-2000s could be regarded as a gap-bridging measure, with the baseline configuration of the off-the-shelf type already proven in service with three export customers at the time. Furthermore, the manufacturer, Irkut Corp, has also promised a rapid delivery schedule, plus relatively high production rates and reasonable prices over the years.

The new two-seat *Flanker* derivative was eventually used to replace the majority of the first/second-generation frontline MiG-29s in three VKS fighter regiments. Six squadrons were re-equipped in the onset of an ambitious VKS Frontal Aviation fleet recapitalisation and capability/growth programme. In AVMF service, the thrust-vectoring two-seat *Flanker* derivative replaced the Su-24M bombers operated by two naval attack squadrons, bringing much higher anti-ship capability thanks to the fielding of the Kh-31A/AD (AS-17 *Krypton*) Mach 3 missile.

The Su-30SM represents, in fact, a budget derivative of the Su-30MKI/MKM export thrust-vectoring versions, developed under a fast-track programme funded by the Russian Ministry of Defence (MOD), with an initial flight-test programme completed in December 2013, while its official commissioning into service as a fully combat-capable air system was declared by the MOD not before 2018.

Compared with its predecessors, the heavyweight thrust-vectoring two-seater, built for the Russian military, features an increased proportion of Russian-made avionics replacing Indian and Israeli-supplied systems, including the radar processors, communications suite, identification



friend-or-foe (IFF) and ejection seats. It has also retained some French-made systems, inherited from the Su-30MKM, such as the Thales CTH3022 head-up display (HUD) and the Sagem Sigma 95NAA hybrid inertial/GPS navigation system, plus the Thales SMD55 and SMD66 multi-functional cockpit displays.

The Bars-R radar, equipping the Su-30SM, has a somewhat enhanced performance compared with the radars installed on the export derivatives in the 2000s. The Su-30SM also features a modified optronic locator and targeting system, the OEPrNK-30SM.

A substantial modification has also been made to enhance the weapons options, including some of the latest Russian air-to-air and air-to-surface munitions. The Su-30SM is touted as being capable of firing the new R-77-1 (RVV-SD) beyond-visual-range (BVR) air-to-air missile (AAM) using active radar homing (ARH), with a maximum range at high altitude in a head-on engagement exceeding 60nm (110km) in addition to the highly-agile R-74M (RVV-MD), a vastly improved R-73 (AA-11 *Archer*) derivative.

Fielding in Russian service

The first two Su-30SMs for the Russian military, assembled at the IAZ plant in Irkutsk, were flight-tested during September 2012 and taken by the VKS in December that year for cycling through a brief test and evaluation programme at the 929th GLITs, the Akhtubinsk-based State Flight Test Centre.

In 2013, 14 Su-30SMs were taken on strength and the type was fielded into service with the Lipetsk-based state personnel training and aircraft field testing centre, the 4th GTsPAPVI, to be used for instructor pilot training and the development of new air combat tactics, operated by the *Flanker*-equipped squadron of what is now known as the 968th IISAP. A batch of four initial-production Su-30SMs were delivered to Lipetsk in August 2013.

The first VKS frontline unit, a component squadron of the 120th IAP, stationed at Domna in western Siberia (previously equipped with MiG-29s), converted to the new type in 2013, and the second squadron of the same regiment went on to replace its worn-out *Fulcrums* with newly built Su-30SMs in 2014. The 120th IAP's fleet comprised 24 aircraft, four of which deployed on short notice to Syria in September 2015. To begin with, the multi-role fighters mainly flew escort missions armed with R-27R/T and R-73 AAMs, but occasionally mounted ground attack sorties, dropping OFAB-250-270 free-fall high-explosive/fragmentation bombs.

In 2015, the 31st Guards IAP, another MiG-29-equipped fighter regiment, based at Millerovo in the southern part of Russia, began converting to the new type, receiving 24 aircraft to equip its two squadrons. In addition, eight more Su-30SMs were taken in 2016 by the 'Russkiye Vityazy' (Russian Knights) air display team of the 237th Guards TsPAT, stationed at Kubinka near Moscow, replacing its first-generation *Flankers*.

In 2017, a dozen aircraft were delivered to equip one squadron of the 14th Guards IAP, a fighter regiment based at Kursk-Khalino previously flying the enhanced MiG-29SMT/



Above **As many as six VKS frontline squadrons, assigned to three fighter regiments, currently operate the Su-30SM in addition to half a dozen aircraft serving in two Su-35S-equipped regiment and another 12 operated by training/tactics development units and one air display team. This specific aircraft belongs to the 14th Guards IAP, a fighter regiment home-based at Kursk-Khalino south of Moscow**



Above **Currently, four Su-30SMs are operated by the 968th IISAP of the Lipetsk combat training centre and two more fly with the VKS's flight test centre, the 929th GLITs at Akhtubinsk, which also uses aircraft from the 31st IAP taken on as needed for various weapons integration trials**



Above **Both the VKS and AVMF Su-30SMs retained a set of French-made avionics mainly represented by the Thales CTH3022 wide-angle holographic HUD, the Sagem Sigma 95NAA navigation system and the SMD55/66 cockpit displays** Alexander Mladenov

Su-30SM weaponry

Ordnance loads cleared for the baseline Su-30SM and carried on 12 hardpoints include up to ten Vympel R-77-1ARH BVR missiles (reported as integrated in 2016 or 2017) or as many as six R-27E/ER semi-active radar homing BVR missiles plus two R-27T/ET IR-homing BVR missiles – alternatively, up to six R-73 or R-74 WVR IR-homing missiles combined with six more BVR missiles, a mixture of R-27s and R-77-1s.

Air-to-ground warloads can include up to six Kh-29T/TD TV-guided missiles or Kh-29L/LD laser-guided missiles. The aircraft can also deploy up to six Kh-31A/AD ARH high-speed anti-ship missiles or Kh-31P/PD anti-radar missiles in addition to Kh-35D anti-ship missiles. The maximum warload carried in the air-to-surface role is 17,632lb (8,000kg). The unguided ordnance includes all Russian bombs and rockets fielded in mass service.

The list of the guided bombs includes the KAB-500Kr and KAB-1500Kr TV-guided bombs in addition to the KAB-500S satellite-guided bomb. A GSh-301 30mm single-barrel cannon is built into the starboard side of the forward fuselage, the muzzle protruding by the rear cockpit. It has 150 rounds, sufficient for five to six seconds of continuous firing of highly destructive 13oz (390g) projectiles at a rate of fire of 25-30 rounds per second.



Abbreviation Guide

Abbreviation	Meaning
IAP	Fighter Aviation Regiment
IISAP	Instructor-Research Composite Regiment
IAB	Fighter Aviation Base
TsPAT	Aircraft Display Centre
GTsPAPVI	State Aviation Personnel Training and Field Trials Centre
OMShAP	Independent Naval Attack Aviation Regiment
MShAP	Naval Attack Aviation Regiment
OKIAP	Independent Shipborne Fighter Aviation Regiment

UBTs, while its second squadron eventually traded its humpback *Fulcrums* for a dozen new-build Su-30SMs in 2018. In addition, the VKS uses the Su-30SM for conversion and continuation training with the two Su-35S regiments stationed in the Far East territories. At Dzemgi, near Komsomolsk-on-Amur, the 23rd Guards IAP took three examples, taken on strength in 2014, and at Tsentralnaya Uglovaya near Vladivostok, the 22nd IAP operates three Su-30SMs, the first of which were inducted in 2016.

The first AVMF Su-30SM unit, a component squadron of the 43rd OMShAP – based at Saki on the Crimean Peninsula and assigned to the Black Sea Fleet – took its initial three jets in 2014 and nine more followed in 2015 and 2016 to complete its full strength of 12 aircraft. These two-seat *Fulcrums* are primarily intended for use in the maritime attack role; the air-to-air operation is their secondary role.

The second AVMF squadron that converted to the Su-30SM is incorporated in the structure of the 4th MShAP, a naval attack aviation regiment stationed at Chkalovsk in the Kaliningrad exclave and assigned to the Baltic Fleet. Its initial aircraft were taken in 2016 and currently it has an eight-strong fleet. Two more Su-30SMs, also taken in 2016, are operated by the 279th OKIAP, a shipborne fighter regiment equipped with Su-33s and stationed at Severomorsk-3 airfield on Kola Peninsula, assigned to the Northern Fleet.

> **'In AVMF service, the thrust-vectoring two-seat Flanker derivative replaced the Su-24M bombers operated by two naval attack squadrons, bringing much higher anti-ship capability thanks to the fielding of the Kh-31A/AD (AS-17 Krypton) Mach 3 missile'**

In May 2015, the Sil Vozdushnoy Oborony Respubliki Kazakhstan (Kazakhstan Air Defence Force, KADF) became the first international Su-30SM operator, taking an initial batch of four aircraft. In the long run, the Asian country intends to purchase as many as 36 thrust-vectoring, two-seat *Flankers* – by mid-2021 its fleet numbered 19 aircraft; one example was lost in a crash in April this year.

Belarus is the second ex-Soviet state electing to purchase the thrust-vectoring, heavyweight multi-role *Flanker* derivative. In November 2019, the Belarusian Air Force and Air Defence Forces took four Su-30SMs on strength, in addition to four Yak-130 jet trainers and light attack aircraft. The Belarusian contract, originally inked in 2017, covers the procurement of a total of 12 *Flankers* to replace, at least partially, the existing MiG-29 *Fulcrum* fleet dating from the Soviet era, with the new fighters scheduled for delivery in batches of four examples over three years.

The Su-30SMs are operated by the 61st IAB (fighter air base) at Baranovichi and are mainly used in the air defence role.

Just like their VKS counterparts, the Belarusian and Kazakhstani thrust-vectoring *Flankers* are built up to the VKS standard and come equipped with a full set of French-supplied avionics systems, including Thales CTH 3022 HUD and multi-functional displays in both cockpits.

Armenia is known as the third Su-30SM customer, taking four aircraft in 2020; sold by Moscow at the same price as was paid by the Russian MOD – said to be significantly lower than the



A Su-30SM from the 120th IAP, toting an air-to-air warload, is seen here operating out of Hmeimim/Latakia air base in Syria in 2015. The weapons fit includes four R-27R BVR missiles in addition to four more R-73s for WVR combat *Russian MOD*



Above **Eight Su-30SMs were delivered in 2016 to equip the 'Russkiye Vityazy'(Russian Knights) display team, assigned to the 237th Guards TsPAT at Kubinka. In addition to the main display role, the team's pilots maintain their combat qualifications and currency while their aircraft remain fully combat-capable**

export price for the type. Just like Kazakhstan and Belorussia, the Su-30SMs for Armenia are in the same configuration as built for the Russian military, with differences to be found only in the identification and communications systems.

The Su-30SME is a newly designed export derivative, offered with all-Russian flight/navigation and mission avionics, and aimed at prospective customers such as Iran, Bangladesh, and Uzbekistan. Myanmar is known as the first Su-30SME customer, placing an order for six examples, priced at US$400m in January 2018.

According to Dmitry Shugaev, the head of Military-Technical Co-operation (Russia's arms export control body), deliveries to Myanmar are due to begin later this year; with their completion set for 2022.

Technical features

The Su-30SM uses the advanced flight control and propulsion technology, originally developed by Sukhoi, Irkut Corp and engine-maker, Saturn-Lul'ka, for the Bharatiya Vayu Sena (Indian Air Force, IAF) Su-30MKI, a vastly improved derivative of the baseline two-seat Su-27UB *Flanker-C*, endowed with true multi-role combat capabilities.

Dating back to November 1996, the Indian mega-deal involved development of an all-new, fully digital mission avionics suite plus greatly enhanced low-speed agility. The Su-30MKI (K denoting *Komercheskiy* [Commercial] and the I for India) was the end result of an ambitious IAF specification calling for the integration of a multi-mode phased-array radar and advanced avionics, representing a bizarre mixture of locally-manufactured, Israeli, Russian and French components.

'The first production-standard Su-30MKI took to the air in December 2001 and an initial batch of ten aircraft was delivered to the IAF in July and August 2002'

'In May 2015, Kazakhstan became the first international Su-30SM operator, taking four aircraft... by mid-2021 its fleet numbered 19'

This highly international avionics suite comes integrated by the Russian company, Ramenskoye Instrument Design Bureau (RPKB), using a quadruple-channel Mil Std 1553B avionics data bus.

A vastly increased manoeuvrability was bestowed on the variant through an enhanced aerodynamic layout using newly added canard foreplanes combined with a sophisticated fly-by-wire (FBW) system and two-dimensional (2D) thrust-vectoring control (TVC) engines. The weapons control system was to be capable of employing a wide range of Russian-made precision-guided air-to-surface ordnance in addition to active radar-homing AAMs.

The initial Su-30MKI prototype, using the baseline Su-30 fuselage and powered by the newly developed AL-31FP TVC engines, took to the air for its maiden flight on July 1, 1997. Flown by the Sukhoi test pilot, Vyacheslav Averyanov, its new aerodynamic configuration featured the all-moving canards and the SDU-10MK FBW FCS, integrated with the thrust-vectoring engine nozzles. The second Su-30MKI prototype – converted from the Su-30PU prototype – flew for the first time in its new guise in March 1998.

The initial pre-production Su-30MKI aircraft, a newly built machine, dubbed at the time Su-30I-2, made its maiden flight in August 2000, equipped with the definitive avionics suite from the outset. It was then involved in an intense testing and evaluation campaign, carried out in Russia and completed not before the end of 2004.

The first production-standard Su-30MKI took to the air in December 2001 and an initial batch of ten aircraft was delivered to the IAF in July and August 2002.

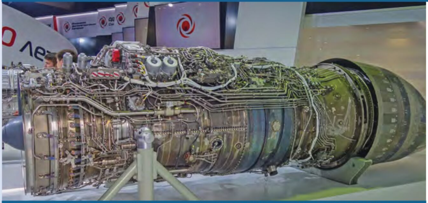
The IAF took delivery of a total of 272 aircraft, including 222 assembled locally by HAL Nasik since 2004 – at least nine of these were lost in accidents over the years. Each Indian-made Su-30MKI costs around US$70.3m, while the Russian-supplied aircraft were priced at US$42.15m, according to senior IAF officials, cited by *Defense News* in August 2019. The last Su-30MKIs were delivered in March 2021. Currently, the Indian MOD is set to place an order for 12 more examples to be supplied from Russia as attrition replacements under an urgent procurement deal, approved in July 2020 by the Defence Acquisition Council (DAC), although no firm contract has been inked yet.

Shortly afterwards, two more countries voted to procure the thrust-vectoring, two-seat *Flanker* derivative. Between 2007





Above ***This Su-30SM pair serves with the 31st GvIAP, a frontline fighter regiment based at Millerovo near Rostov-on-Don in Russia's Southern Military District***



Above ***The AL-41F-1S is the new-generation engine integrated into the enhanced Su-30SM2 in order to provide a leap in the flight performance of the heavyweight fighter, thanks to the significantly increased power rating, while also retaining the much-prized thrust-vectoring control capability***
Alexander Mladenov



This Su-30SM pair belongs to the 4th MShAP, a naval attack regiment home-based at Chkalovsk in the Kaliningrad exclave, assigned to the Baltic Fleet's aviation service

Improved engines

The Su-30SM's Saturn-Lul'ka AL-31FP afterburning turbofan, produced at the UMPO plant in Ufa, uses a 2D moving nozzle that can deflect through 15° up and down, with swelling axis canted at 32° sideways. This clever design solution enables 2D thrust vectoring to provide both vertical and lateral control forces thanks to the differential deflection of the widely spaced nozzles.

The nozzles can be synchronised with the tailplane movement or can move independently, on commands issued by the aircraft's fly-by-wire flight control system. Differential thrust control enables *Flanker* pilots to manoeuvre at extremely low or even zero airspeed, when its aerodynamic control surfaces are rendered ineffective.

The TVC-equipped AL-31FP uses hydro-electronic controls and generates 27,560lb st (122.59 kN) of thrust in full afterburner, while its dry rating is set at 16,750lb st (75.46 kN).

and 2017, Algeria took a total of 58 aircraft in a customised configuration dubbed Su-30MKA. In turn, Malaysia got 18 more in another highly customised configuration, known as the Su-30MKM, with deliveries reported between 2007 and 2009.

Sensor outfit

The Su-30SM's weapons control system is based on the Tikhomirov NIIP N011M-R Bars-R radar, equipped with a one-metre diameter passive electronically-scanned array (PESA), which features added-on mechanical steering in azimuth for expanded spatial coverage. This design solution allows the radar beam to be steered up to 70° to the left and right (in azimuth) and 45° up and down (in elevation). The radar retains two Indian-supplied computers while the weapons control system employs a newly supplied Russian mission computer.

Data released by Tikhomirov NIIP claims that the Bars radar (this could be valid for its latest export derivative) has a head-on detection range of up to 81nm when deployed against small-size fighters. Tail-on detection range against fighter targets extends to 33nm. In its latest guise, also believed to have been implemented in the Su-30SM's Bars-R, the radar is advertised as capable of simultaneously tracking up to 25 airborne targets while supporting engagement of up to eight of these with BVR ARH missiles (four and 14 targets, respectively, claimed for the earlier Bars derivatives used on export-standard aircraft). In the air-to-air mode, the radar is able to track a target that generates electronic jamming, and it is also claimed to have non-co-operative target recognition capability. The Bars-R features a plethora of air-to-surface modes for detection and tracking of fixed and moving targets; it

can also provide ground mapping with low- to high-resolution, and facilitate terrain-following flight in automatic mode. The baseline radar, as used on the IAF *Flankers*, is advertised as being capable of seeing a group of tanks at 24-27nm distance with a resolution of 20m, while small to medium-size surface targets can be detected from 65-91nm; detection range for a large bridge extends up to 65nm and for a large warship up to 81nm.

It can track up to two ground or sea targets simultaneously while continuing to scan for air targets and engaging a single air target with radar-guided missiles. The radar is integrated with the Kh-31A anti-ship missile and can provide it with pre-launch preparation and guidance cues.

The OEPrNK-30SM is an integrated electronic-targeting suite that incorporates the OLS-30 optronic locator and targeting system, together with a helmet-mounted cueing system, the NSTs-T or NSTs-Sura, the SUO targeting system, SOI display system and a mission computer. The suite operates in conjunction with the radar and enables targeting and guidance of air-to-air and air-to-surface ordnance.

Using a sensor head assembly ahead of the windscreen and offset to starboard, the OLS-30 integrates an infrared search and track (IRST) sensor and a laser rangefinder. Quoted as being capable of tracking aerial targets at high altitude at up to 90km tail-on and 50km head-on, it scans through 60° in azimuth (10° down and 60° up). The system is provided with two fields of view – wide (20°×5°) and narrow (3°×3°), the latter intended for precise targeting in BVR and within-visual-range (WVR) air-to-air combat. The laser rangefinder is useful at up to 3km against air targets and is capable of lasing ground targets at up to 10km range, for targeting support of laser-guided weapons.

Su-30SM's self-protection suite incorporates the L150 Pastel Radar Homing and Warning System (RHAWS), the Khibini-U podded radar jammer and UV-30MKR chaff/flare dispensers. The L150 RHAWS also facilitates targeting for the Kh-31P high-speed anti-radiation missile and its improved derivative, the Kh-31PD, thereby allowing the Su-30SM's effective use in the suppression of enemy air defence (SEAD) role.



Above **Currently, the list of Su-30SM-equipped VKS frontline units includes three two-squadron regiments that previously flew 'vanilla MiG-29s' – the 120th IAP at Domna in the Eastern Military District (MD), the 31st GvIAP at Millerovo in the Southern MD and the 14th Guards IAP at Kursk-Khalino, with all of these receiving 24-strong fleets**



Above **The Su-30SM retains the large-area airbrake inherited from the Su-27UB Flanker-C**



Above **The Belorussian Air and Air Defence Force operates four Su-30SMs and looks forward to receiving eight more examples to fully equip a fighter squadron of the 61st IAB at Baranovichi** *Belorussian MOD*



Su-30SM specifications

Wingspan	48ft 3in (14.70m)
Overall length	71ft 11in (21.94m)
Height	20ft 10in (6.36m)
Wing area	667sq ft (62m²)
Normal take-off weight	56,658lb (25,700kg)
Maximum take-off weight	74,956lb (34,000kg)
Maximum weapon load	17,637lb (8,000kg)
Normal internal fuel load	11,615lb (5,270kg)
Maximum internal fuel load	21,247lb (9,640kg)
Maximum speed (at sea level)	728kts (1,350kph)
Maximum speed (at high altitude)	1,144kts (2,120kph)
Maximum operating speed	Mach 1.75
Practical ceiling	52,808ft (16,100m)
Ferry range (at high altitude)	1,618nm (3,000km)
Ferry range (at low altitude)	685nm (1,270km)
Ferry range (with one in-flight refuelling)	3,023nm (5,600km)
Take-off run	1,869ft (570m)
Landing roll	2,197ft (670m)
G-limit	+9G

New-generation *Flanker*

Currently, the thrust-vectoring Su-30SM multi-role two-seater is the mainstay of the VKS' new-generation *Flanker* fleet, with 91 examples fielded with the VKS as of July 2021 out of 92 delivered between 2012 and 2018; 22 more are in operation with the AVMF.

The Su-30SM2 is a significantly enhanced version, still in development with Sukhoi and Irkut Corp. In August 2020, 21 aircraft were ordered for the AVMF, to replace the existing fleet of worn-out Su-24M bombers.

In addition, the existing Su-30SM fleets, operated by both VKS and AVMF, are also earmarked for upgrade to the SM2 standard, with completion of the works, according to the Russian newspaper, *Izvestia*, scheduled for 2027. Additional orders for this enhanced derivative are expected for the VKS in the early 2020s.

Among the main aims of the SM2 upgrade is to achieve as much commonality as possible with the Su-35S – a highly-advanced single-seat *Flanker* derivative, fielded in VKS service for the first time in 2014.

This includes the integration of the new AL-41F-1S TVC engine, which can provide a much-increased thrust-to-weight ratio, when compared with the existing Al-31FP. It also boasts lower specific fuel consumption and longer time between overhauls and service life. The engines, combined with a new auxiliary power unit, promise a welcome performance boost to the 34-tonne multi-role fighter when hauling heavy warloads.

The Su-30SM prototype, used as a testbed for the new engine, made its first flight in early 2021 powered by one modified AL-41F-1S and one AL-31FP.

The AL-41F-1S afterburning turbofan is rated 31,960lb st (14.22kN) in the so-called emergency power mode while its combat power rating (i.e. the regular afterburner setting) is set at 30,856lb st (13.73kN) and the military power rating is 19,395lb st (8.63kN). Response time from idle to combat power is between three and five seconds.

The new engine is 419lb (190kg) lighter than the AL-31FP and its dry weight is 3,535lb (1,604kg), while the service life is 4,000 hours and its time between overhauls is set to extend to 1,500 hours.

The MOD-funded avionics and system upgrade programme, dubbed 'Adaptatsia-Su', includes a package of Russian systems replacing the French-supplied hardware that could be found in the baseline Su-30SM. The CTH3022 HUD was replaced by the IKSh-1M borrowed from the Su-35S while the BINS-SP2 hybrid inertial/satellite navigation system replaces the Sigma 95NAA.

In turn, the SMD55 and SMD66 displays are superseded by the MFI-66, and the Russian NStS-T-03 helmet-mounted cueing system replaces the Ukrainian-supplied NStS Sura.

The Su-30SM2 will also feature much more capable mission computers and an enhanced radar, a N011M Bars-R derivative with significantly increased detection and tracking performance in the air-to-air mode, using Russian-made electronic components only. The list of the other principal mission avionics, newly added in the SM2 upgrade, also includes the OSNOD multi-channel communication and tactical information distribution system, which is also endowed with navigation and identification functionality. It enables the aircraft's integration in Russia's new-generation command-and-control network for air operations.

The aircraft's arsenal will be also expanded thanks to the integration of the latest Russian-made air-to-air and air-to-surface guided munitions, but no details have been disclosed so far.

Another important component of the enhanced mission configuration, already proven on the 'vanilla' Su-30SM are the KNIRTI SAP-518SM jammer pods, believed to be part of the Khibini-U self-protection jammer system. They provide a vastly enhanced protection capability against a wide variety of radar threats, including active-radar guided missiles and target acquisition radars.

Using the Digital Radio Frequency Memory (DRFM) technology, the system with wingtip-mounted jammer pods was fielded for the first time on the regular Su-30SMs operated by the VKS in 2018. AFM



The vastly improved two-seat Su-30 derivatives built in Irkutsk, endowed with thrust-vectoring control and true multi-role capabilities, were first exported in the late 1990s to India and later on to Algeria and Malaysia, but Russia didn't order its first examples before 2012

Subscribe to **www.Key.Aero** for breaking news stories. E-mail the news team at **editor@airforcesmonthly.com**

Report into MQ-9A Reaper loss in Africa Command AOR released

A NEWLY released US Air Force Abbreviated Aircraft Accident Investigation Board (AAIB) report has revealed the previously unreported loss of an MQ-9A Reaper remotely piloted aircraft system (RPAS) in an unspecified location in the US Africa Command (US AFRICOM) Area of Responsibility (AOR) on June 24, 2020.

The report, released on June 8, 2021, identifies the MQ-9A involved as tail number 08-4051 assigned to the Arizona Air National Guard's 214th Attack Group 'Black Sheep' – a component of the 162nd Wing at Davis-Monthan AFB, Arizona.

On June 24, 2020, at 0933hrs Zulu time (Z), the mishap aircraft (MA), an MQ-9A, tail number (T/N) 08-4051, crashed in an undisclosed location within the US AFRICOM (African Command) AOR.

Assigned to the Arizona Air National Guard's 162nd Wing, the MA was operated by the 214th Attack Squadron Mission Control Element (MCE) located at Davis-Monthan AFB, Arizona, at the time of the mishap.

The location of the crashed MA was confirmed, but the wreckage was not recovered. The loss of government property was valued at US$11,290,000. There was no reported damage to civilian property, injuries or fatalities.

At approximately 0640hrs (Z), the Mishap Ground Control Station (MGCS) started to display warnings that the fuel level in the header tank was low. The Mishap Pilot (MP) and Mishap Sensor Operator (MSO) began to accomplish procedures to clear this fault. Soon thereafter, the MP noted through fuel calculations that the measured fuel was well short of expected levels.

The MP enlisted the assistance of the Mishap Mission Crew Commander (MMCC) to help diagnose the problem. As the MP and MMCC worked the problem, the MSO used the primary camera to visually sweep the MA. During that sweep, the MSO found that the MA was severely leaking fuel from the fuselage. At 0723hrs (Z), the crew started to return to base at maximum airspeed and declared an emergency.

Without knowing exactly where in the fuel system the leak was, the MP concluded that if it was not affecting the aft tank and header tank, then a safe recovery was theoretically possible. After further analysis, the crew realised that the fuel leak was catastrophic. Soon after, the MGCS displayed a 'Fuel Leak Detected – Fwd' warning. At this point the MP and MMCC determined that there was insufficient fuel to return to base.

The MP and MMCC, co-ordinating with Combined Air Operations Center (CAOC) Remotely Piloted Aircraft Liaison Officer (RPA LNO), started a plan to crash the aircraft.

The CAOC directed MMCC and MP to crash the aircraft and to do so in a way that would minimise chances of a successful recovery effort. Fuel was exhausted at 0914hrs (Z). The MP then controlled the glide of the aircraft to optimise the impact point. As the aircraft lost altitude, the MP increased the airspeed of the MA through the crash, which occurred at 0933hrs (Z).

The AAIB President found, by a preponderance of the evidence, the cause of the mishap was a fuel leak from the Forward Electric Fuel Heater that caused fuel exhaustion before the aircraft could be safely returned to the Launch and Recovery Element. Further, the AAIB President found, by a preponderance of the evidence, that each of the following factors substantially contributed to the mishap: 1: Delinquent Time Compliance Technical Order (TCTO) to correct a known MQ-9 deficiency; 2: the design of the fuel leak detection system; and 3: lack of guidance and tolerances for the MQ-9 fuel system. AFM



Fully armed US Air Force MQ-9A Reaper 13-4252 'AZ' operated by the Arizona Air National Guard's 214th Attack Group 'Black Sheep' during Exercise Northern Strike 19 in July 2019 in Michigan. A similar UAV from the unit was the subject of a newly released accident report *US Air National Guard/Senior Airman Ryan Zeski*



***The unidentified Iraqi Army Aviation Corps Mi-171 at Al Asad Air Base on July 7. The date of its crash is unknown** US Army/Cpl Jacob Gleich*

Date	Nationality/unit	Type	Serial
May 5	**UAEAF&AD/86 Sqn**	**Mirage 2000-9DAD**	

A reader has alerted *Air Forces Monthly* to this previously unknown accident, which appears to have been completely unreported. This two-seat aircraft was conducting night-time circuit training at Al Safran (Liwa) Air Base with an Emirati student in the front seat and a French instructor in the back. After undershooting on approach at around 2230hrs, the Mirage hit the barrier (which was down) and this caught on the undercarriage, causing the aircraft to veer off the runway. The instructor then ejected, but the student remained with the aircraft. A civilian search and rescue helicopter contracted to the UAE armed forces recovered the two crew members, who had both only suffered minor injuries, and transported them to a military hospital in Abu Dhabi.

Jun 8/9	**Afghan Air Force**	**Mi-17V-5**	**745**

The identity of this helicopter, which crashed during the night in Maidan Wardak province, is now known and is as given above. See *Attrition*, August edition, p96.

Jun 25	**Colombian Air Force/ Esc 821**	**UH-60L Halcon**	**FAC0007**

While transporting the Colombian President Ivan Duque after a visit to the municipality of Sardinata, Catatumbo, in the Norte de Santander administrative region of the country, the helicopter was fired on from the ground near Catatumbo at around 1500hrs local time while returning to Cúcuta. Sustained gunfire was heard by the occupants for between 15 and 20 seconds as the helicopter descended for landing. However, no one on board was injured. Although the helicopter landed safely, subsequent inspection revealed that there were bullet holes and damage to various parts of the airframe, including the main and tail rotors, plus the tail rotor driveshaft housing on top of the rear fuselage. In addition to the President, also on board were ten others, including two ministers, three local dignitaries, the President's brother, two pilots and two auxiliaries.

Pre-Jul 7	**Iraqi Army Aviation Corps**	**Mi-171**	

This heavily damaged Mil Mi-171 was moved from where it had been dumped by US personnel at Al Asad Air Base in Iraq's Anbar province on July 7 by US Air Force (USAF) engineers from the Air Expeditionary Squadron working with the Combined Joint Task Force-Operation Inherent Resolve (CJTF-OIR) in the country. The aircraft's removal had been conducted by US forces following a request for delivery to the Iraq Security Forces. Images released by CJTF-OIR show it being prepared for unloading from a flatbed trainer at Al Asad, suggesting that it had only been moved from one part of the base to another, although it is unclear what purpose it will now serve. In the area where it was being unloaded there were a number of derelict former Iraqi Air Force aircraft visible, including an L-29, MiG-21, MiG-25 and other unidentified hulks. While there have been no official reports of any recent Iraqi helicopter crashes, it was clear that the Mi-171 in question had been involved in some kind of accident, as the main rotor blades and tail boom had all been torn away from the helicopter, rather than just being removed for transport. The undercarriage was also missing and there were signs of damage in other areas of the aircraft. It is believed that the accident probably happened some time ago, as the hulk had already been seen derelict at Al Asad back in May this year when it was thought to have already been there for quite a while.



Above: ***Pakistan Army Aviation Corps MFI-17 Mushshak 80-5098 after its accident on August 12** via Waseem Abbas*

Subscribe to **www.Key.Aero** for breaking news stories. E-mail the news team at **editor@airforcesmonthly.com**



Russian Navy Be-200ChS RF-88450/'20 Yellow' taking off from Taganrog for its maiden flight on February 14, 2020. The aircraft was destroyed in a crash in Turkey on August 14, killing all eight on board UAC

Jul 29 | Iraqi Army Aviation Command/4th Utility Squadron | Mi-171 | Yi-258

The identity of this helicopter has been confirmed, as given above. It was written off when it crashed near Tuz Khurmatu. See *Attrition*, September issue, p97.

Aug 3 | Indian Army Aviation Corps/254 Army Aviation Squadron | HAL Rudra

This helicopter crashed into the waters close to the Ranjit Sagar Dam, about 30km from Pathankot in the Punjab, close to the Jammu and Kashmir border, at around 1035hrs local time, after taking off from Mamun cantonment ten minutes earlier. Some wreckage and helmets were recovered from the scene but the crew had not been found by the end of the day and divers were due to resume the search the following morning. At the time the area was full of tourists visiting the dam and eyewitnesses reported that the helicopter had been carrying out a low-level sortie over the lake when it appeared to have experienced technical difficulties and the engine suddenly stopped and it plunged into the water. One body was found on August 15, other still missing.

Aug 3 | Russian Armed Forces | Forpost UAV

This unmanned aerial vehicle (UAV) was destroyed when it crashed and caught fire near the town of Kafr Nuran, Aleppo Governorate, Syria. It was reportedly shot down.

Aug 4 | Tajikistan Border Guards Service | Mi-8

While attempting to rescue Russian climbers near Poi Mazzor on the Khirson Glacier the helicopter was written off when it crashed while attempting to land. The pilot was killed and the other four on board were seriously injured.

Aug 6 | Pakistan AF | JF-17B Thunder | 20-614

This aircraft crashed near Attock during a routine training sortie. Both pilots ejected safely. No other details about the circumstances of the crash are known at present.

Aug 6 | US Air Force/319th Reconnaissance Wing/348th Reconnaissance Squadron | RQ-4B Block 40 Global Hawk

While returning to its base at Grand Forks Air Force Base, North Dakota, the aircraft crashed at approximately 0700hrs Central Standard Time in a rural field near Gilby, North Dakota, on the 2700 block of 27th Avenue Northeast, about 4 miles north of the airfield. No injuries were reported on the ground. The ensuing ground fire was extinguished and the incident is under investigation with recovery operations underway. Col Jeremy Fields, 319th Reconnaissance Wing vice commander, said that the "319th Reconnaissance Wing has personnel on site and we anticipate recovery operations and the official investigation may take several weeks. I'd like to personally thank local law enforcement, Customs and Border Protection and emergency services for their support on scene."

Aug 8 | Hellenic Air Force/359 MAEDY/351 MAE | PZL-Mielec M-18 Dromader | 128

While carrying out a firefighting mission the aircraft crashed and was written off at Machairado on the Greek island of Zakynthos. Local firefighters were able to rescue the pilot and he was reported to be safe and in good health and had sustained no injuries.

The aircraft was one of two Dromaders that had been deployed to assist firefighters on the ground who were battling a fire in the Lagopodo-Macherado area. The crash was reported to have been due to loss of control in the hot air layers, following which it crashed after hitting trees.

Aug 8 | Myanmar Air Force | 4 x F-7IIK Airguard, 2 x MiG-29UB

During an attack at around 0400hrs local time on Magway Air Base/New Magwe Airport by anti-government forces using rockets and two bombs made with RDX explosives, four of the above aircraft were reported destroyed and two others damaged. The bombs reportedly exploded near the base's weapons storage facility.

Later, on August 10, Myanmar's Air Force Chief General Maung Maung Kyaw visited the base to examine the damage that had been caused by the attack. Another attack was reportedly carried out on Meiktila Air Base, but it is unconfirmed whether any aircraft were damaged there. Although officials have refused to comment, on August 14 local media revealed details of the incidents, which were also confirmed by local residents.

Aug 10 | Bolivian Air Force | Unidentified type

Five of the 11 Bolivian Air Force soldiers on this aircraft were injured, two of them seriously, when it was written off in a crash near the community of Bella Vista in the department of Beni at around 1200hrs local time. At the time, the aircraft was en route to Trinidad to pick up a confiscated drugs plane of Brazilian origin. The aircraft had been seized by the Fuerza Especial de Lucha Contra el Narcotráfico (FELCN – Special Force to Combat Drug Trafficking) personnel after it had failed to take off due to mechanical failures. The injured soldiers were taken to El Trompillo Airport and then later transferred to the Foianini clinic in Santa Cruz.



Above: ***Russian Air Force Il-112V '01 Yellow'/RF-41400 taking off from Voronezh on March 30, 2021, for its second flight. It was destroyed in a crash on August 17, killing all three crew*** UAC



Above: ***The tail of Indian Air Force MiG-21 Bison CU2266 was one of the only remaining unburnt components after its crash on August 25***

Aug 10 — Russian Air Force/205th UAB — DA42T Twin Star '26 Red'/RF-93267

This aircraft was substantially damaged when it ran off the runway at around 0952hrs local time at Balashov Air Base in the Balashov Saratov region. As it sank into soft ground the port propeller blades were torn away and the leading edge of the port wing extensively damaged inboard of the engine; the underside of the rear fuselage rudder was also badly crumpled. It is not known if the two occupants were injured.

Aug 12 — Pakistan Army Aviation Corps — MFI-17 Mushshak — 80-5098

This aircraft force-landed near Jhelum, Chamla, flipping over and coming to rest inverted in a field. Both crew members survived the accident. The fin and extreme rear fuselage were badly crumpled, but the remainder of the Mushshak appeared to be relatively intact.

Aug 13 — Brazilian Army/4th BAVEx — HM-1A Pantera K2 (AS565AA Panther) — EB-2021

While en route from Ponta Pelada Aerodrome in Manaus on an operational mission to Itaituba in a thunderstorm the helicopter crashed into a lake at around 1100hrs local time near Careiro da Várzea in the Amazonas region, 80km from Manaus. Amateur video of the accident showed it spinning out of control and descending rapidly before hitting the water. One of the six soldiers on board was killed and the other five evacuated to the Manaus Regional Military Hospital.

Aug 14 — Russian Navy/859th TsBPiPLS — Be-200ChS — '20 Yellow'/RF-88450

All eight personnel on board were killed when this multipurpose amphibian crashed into a mountain in Turkey while engaged in firefighting operations. Those killed comprised five Russian Navy crew members and three Turkish nationals. The aircraft had just completed a water drop on a fire near the city of Kahramanmaras in southeastern Turkey when it struck the mountain, broke up, caught fire and was destroyed. It was leased to the Turkish Department of Forestry from the Russian Federation to assist in fighting the forest fires in Turkey and had arrived in the country on July 8. The aircraft was only 18 months old, having made its maiden flight on February 14, 2020.

Aug 17 — Russian Air Force — Il-112V — '01 Yellow'/RF-41400

This aircraft, the first prototype of the new light military transport aircraft, was destroyed in a fatal accident on August 17, killing all three crew members. The aircraft had departed from Zhukovsky Air Base at 1035hrs local time before landing at Kubinka Air Base at 1109hrs. It took off again at 1114hrs for a routine test flight. Four minutes later the crew radioed that they had a serious fire in the No 2 (starboard) engine. Amateur video footage of the last moments of the sortie showed a large plume of flame coming from that engine. Control was then lost and the Il-112 slowly began rolling to starboard and losing altitude before the nose dropped and it rolled inverted at low altitude before plunging almost vertically into the ground at 1120hrs in a forested area less than a mile from the runway at Kubinka Air Base and exploding in flames.

Aug 18 — Russian Air Force/116th TsBPIA — MiG-29SMT

This aircraft crashed, killing the pilot, when it came down in an open area near the Ashchuluk training ground, in the Astrakhan region, during a routine training flight, according to the press service of the Southern Military District. The fighter had been acting as an enemy aircraft, undertaking a simulated low-level, night-time bombing mission for the purposes of calibrating anti-aircraft systems and training other fighters. After flying over the intended target at an altitude of about 1,300ft, the aircraft turned and began to lose height before impacting the ground near the runway at Astrakan-Ashchuluk Air Base. The aircraft was not carrying any ammunition at the time.

Aug 19 — US Navy/Training Air Wing 5 — TH-57 Sea Ranger

While on a routine training flight from Milton-Whiting Field Naval Air Station South Airport, Florida, this helicopter crashed at around 1345hrs local time in an open field near a wooded area off Highway 87 at East Milton, just west of Naval Outlying Landing Field Santa Rosa, Florida. Both occupants, an instructor pilot instructor and student naval aviator, were seriously injured, one being transported by air and the other by ambulance to a local medical facility. The helicopter was substantially damaged.

Aug 23 — Russian Air Force — MiG-29SMT

While undergoing routine scheduled maintenance at Astrakan-Ashchuluk Air Base, the aircraft was destroyed after it caught fire and was engulfed by flames. No one was reported injured.

Aug 25 — Indian Air Force — MiG-21 Bison — CU2266

After take-off for a routine training sortie, this aircraft experienced a technical malfunction at around 1730hrs local time and crashed at Bhurtiya village in the Barmer district of Rajasthan. The pilot ejected safely. The crash set fire to a thatched hut, but no one was in it at the time and there were no injuries on the ground. A Court of Inquiry has been ordered to ascertain the cause of the crash.

Aug 25 — Mexican Navy — Mi-17-1V — ANX-2218

While preparing to land at a sports facility in Agua Blanca municipality, Hidalgo state, this helicopter began spinning and descending rapidly before hitting the ground heavily, causing the undercarriage to collapse. The tail boom was also severed and the main rotors torn off before the Mi-17 came to rest, upright on its belly. There were four minor injuries reported among the 20 people on board, which included the head of the Interior Ministry of Veracruz and other State officials. Three of them were transferred to a hospital in the municipality from Metepec, Hidalgo and one to the Santa María Clinic, in Tulancingo, Hidalgo, to receive medical attention. The helicopter had been carrying out a reconnaissance and transportation mission, overflying areas affected by Hurricane Grace as part of Government support to recovery efforts.

Aug 27 — Russian AF — Su-24M2 — '85 Red'/RF-95099

This aircraft crashed into a forest near Vereshchagino, 95km west of Perm in eastern Russia, following a technical failure during a ferry flight to an aircraft repair company for repairs. Both pilots ejected safely.

Additional material from: Donny Chan, Andrew Mottram, Scramble/Dutch Aviation Society, René L Uijthoven and Asagiri Yohko. AFM



Above: ***Wrecked Mexican Navy Mi-17-1V ANX-2218 after its crash on August 25***

Next Issue

Lightning strikes in the Baltic

From May to August 2021, four Italian Air Force F-35A Lightning IIs deployed to Estonia for the first time to support NATO's Baltic Air Policing initiative. We provide in-depth insight into this historic mission.



A pair of Italian F-35As fly over the Gulf of Finland during the type's first operational deployment in support of NATO's Baltic Air Policing initiative *Giovanni Colla/Remo Guidi*

Next Issue
The November issue is on sale from October 21 2021*

** On sale date may vary by region. Content subject to change.*

• Bulgarian air defences

AFM charts the slow and often painful transformation of the Bulgarian Air Force's air defence assets as the country transitions from its Soviet-era fighters to Western-made aircraft.



The two Evreux-based Transall C-160G Gabriels of EEA 1/54 'Dunkirk' in flight. Under current plans, this matured SIGINT fleet will have been completely withdrawn from French service by the end of 2028 *AAE*

• Macedonia burns

With its Air Tractor AT-802A Fire Boss aerial firefighting aircraft unserviceable, Macedonia was thrown into chaos this summer after being devastated by wildfires. We explain how Serbia, Romania and Montenegro stepped in to aid the Balkan nation.

• French ISR

We give an exclusive insight into the platforms that have served the French Air and Space Force's secretive Airborne Electronic Squadron 1/54 'Dunkirk', which is based at Evreux.

• Forgotten soldiers of fortune

AFM investigates the privately contracted aviators who have played a major role in the war against powerfully armed and motivated jihadist groups in Africa in recent years.

• Plus the best military aircraft news coverage of any aviation magazine anywhere!

